

AVIATION WEEK

A McGRAW-HILL PUBLICATION

APR. 28, 1952

50 CENTS

Greater Safety for Sub-Killers!



PRIME antisubmarine patrol plane of the U.S. Navy is the Lockheed P2V-5 "Neptune"—one of a long series of naval aircraft to rely on Goodyear bullet-sealing fuel tanks for added protection.

Tanks in the "Neptune" are lineal descendants of the first practical self-sealing airplane tank—Goodyear-developed at the end of World War I—and the improved tank that was standard for World War II aircraft. It features a lining of synthetic rubber and cord in a completely nonmetal tank—effectively seals itself when punctured by gunfire.

Here—as in planes of all types the world over—Goodyear developments are relied upon to increase safety and dependability. For further details on tanks, tires, tubes, wheels, brakes and AIRFOAM Super-Cushioning, write:

Goodyear, Aviation Products Division

Akron 16, Ohio or Los Angeles 54, California



Installing Goodyear bullet-sealing tank in wing of P2V-5, shown in flight in smaller picture





ZENITH parts in the F-84E

Riveting from the sky at meteor-like speed, Republic's USAF Thunderjet brings to bear an armament seldom concentrated in one fighting machine of its type. Every part in such a machine must be engineered with such electrode, built with such strength to withstand terrific stresses; that it must have behind it the breadth of experience in reinforced plastics which has brought Zenith the confidence of both the USAF and the aircraft industry.

Consult the Zenith engineering staff for any problems encountered with reinforced plastic applications in both the military and civilian fields.

ZENITH PLASTICS COMPANY • Gardena, California



Complete Information on Ball Bearings

*At your
fingertips...*

New Departure's library of technical books for engineers and designers contains the most complete, practical and authoritative data available in the ball bearing industry.

This specialized information, gained from years of expertise and extensive field and laboratory research, is available to you under the single-subject headings listed below.

Personal consultation with New Departure engineers is responsive; while your design is in the formative stage.

Please write for names of these books. Please indicate company affiliation and strategy desired by your order letter.

CODE
Letter

BOOKS ON DESIGN

- BA Bearing Application (Part I)
- BB Design of Bearings (Part II)
- BC Backlash & Lubrication (Part III)
- BD Design of Lubrication Systems (Part IV)
- AF Application Handbook (Part V)
- LF Full Scale Drawings of Bearings
- SI Tables, formulas, bearing principles, tool computations, bearing machinists

MAINTENANCE AND SERVICE

- SP Service Procedure for Ball Bearings
- R Reconditioning Re-lubrication Bearings
- PW From "Wear" Adjustment Chart

GENERAL

- A Selected Catalog (Handbook Vol. I)
Explanation of ball bearing systems
- D Solid bearings (Explanation of Principles)
- TD Technical Data for the automobile industry
New Steel Rule Ave Made
- EM Decimal Equivalent Tables 14 sizes
- ED Why Anti-Friction Bearings (Explanation of Frictionless Principles)

— and many other titles too numerous to mention. Talk to your needs!



NEW DEPARTURE BALL BEARINGS

Nothing Rolls Like a Ball

NEW DEPARTURE • Division of GENERAL MOTORS • BRISTOL, CONNECTICUT

40 YEARS OF AUTOMATIC FLIGHT...BY SPERRY



1912 The first Sperry autometric pilot was flight tested in a Curtiss Hydroplane in 1912 at Hammondsport, New York. This was the world's first gyroscopic autometric pilot to fly an airplane.



1914 Lawrence Sperry, an early advocate of automatic flight in Paris, 1914, won the International Safety Competition with his "stable" aeroplane.



1916 An先 of the guided missile was the aerial torpedo developed during 1916-17 by Sperry working with the U.S. Navy. These automatically controlled "flying bombs" were tested over Great South Bay, Long Island.



1933 Automatic flight again won public recognition in 1933 when Wiley Post made the first solo flight around the world with the Sperry autometric pilot as his "co-pilot" in the *WORLD MAIL*.



1937 First completely automatic landing was made by the U.S. Army Air Corps in 1937 by coupling radio with the Sperry autometric pilot.



1943 The first electronic autometric pilot made thousands of 0-24s in World War II and advanced the art of precision bombing by providing an improved stable platform.



1947 The first "pilotless" aircraft, U.S. Air Force's All Weather Flying Bombs, C-54, equipped with Sperry electronic pilot and automatic approach device, crossed the Atlantic both ways in 1947 without human hands touching the controls—including take-offs and landings.



1952 The modern Gyroplane® flight control is the outgrowth of Sperry's 40 years of research, development and manufacture of automatic controls for aircraft. This versatile, all-weather pilot represents a high-performance technique for automatic control which is readily adaptable to all types of aircraft—aircraft, maritime craft, jets, helicopters, fighter-bomber aircraft and guided missiles. This technique, powered by Sperry, has led to a new fundamental concept of flight for the aircraft of tomorrow. Sperry Gyroscope Company Division of The Sperry Corporation, Great Neck, New York.

NEWS DIGEST

DOMESTIC

Colonial Airlines, Inc., suffered a net loss of \$31,613 in February after adjustment for income taxes. Operating revenues were \$795,135.

Douglas Aircraft Co., Santa Monica, had net sales of \$181,219,495 for the first quarter ending Feb. 28, with net earnings of \$1,992,000. Building at the end of the three-month period was \$1,545,152,902.

Minneapolis-Honeywell, Minneapolis, Minnesota, had net sales of \$155,151 in 1951, net income after taxes was \$9,277,510.

Seaboard & Western Airlines, Inc., had net earnings of \$78,236 during 1951 on operating revenues of \$10,756,342.

Delta Air Lines reports net profits of \$8,273,216 after taxes for the nine months ended Mar. 31; net income was \$3,617,841.

American Airlines, Inc., had net profit, after taxes, of \$994,814 for the quarter ended Mar. 31.

Civil aircraft designers in Taiwan started 227 planes, 761,000 lb. average weight, valued at \$13.5 million. Design shipments came to 99, aggregating 24,900 kg.

Two Republic F-84G Thunderjets made nonstop 4,775 mi. flight across the U.S. Mar. 15, dropping practice bombs on a California target. Planes were refueled en route by Boeing KB-50 tankers. The nonstop flight lasted 10 hr. 11 min.

John F. Flanagan, Assistant Secretary of Navy for Air, presented recently as a career pilot. Flying a North American SNJ plane, he made three solo landings aboard the Navy's assault aircraft USS Cabot.

Navy accepted first Marlin (PBM) Marlin at ceremony April 23. The 36 ton anti-sub patrol bomber comes both radar detection and demolition equipment.

FINANCIAL

Transocean Corp., Dallas, and its subsidiary, Luminous Aeroplane Corp., Dallas, report unadjusted consolidated net profit of \$221,151 for the first two months of 1951, after provision for taxes.

AVIATION WEEK, April 26, 1952

OMNI is for EVERYBODY!



...and ARC's VHF EQUIPMENT brings it to YOU!

Whether you fly private, executive, or transport aircraft, you can enjoy stability of OMNI with ARC's complete type 13C VHF Navigation Equipment. OMNI takes the work out of navigation—gives you a reliable aid to follow, a more accurate bearing, and the means to stay in contact with the station. Learn more about OMNI and keep the need of your ABC equipment at arm's length with these...an avionic masterpiece.

You get dependable navigation when you need it most! According to OMNI navigation, the IBC provides for use of the visual range and runway location. And with an ARC type 17 VHF 2-way Communications System added, you get independent, simultaneous voice communication. OMNI navigation gives you dependable navigation and communication you can't afford to be without. Write for all the details.

ARC Aircraft equipment is Type Certified by CAA. It is designed for maximum performance and to meet a wide variety of needs. In high altitude and endurance aircraft the model truly matches the latest service standards.



AVIATION RADIO CORPORATION
Research New Jersey
Dependable Service Founded 1926

**MUST
YOUR EQUIPMENT
BE RADIO
INTERFERENCE FREE?**

If yours is a truly
RF INTERFERENCE PROBLEM—
LET FILTRON SOLVE IT...

When your equipment must meet the military RF interference limits, consult with FILTRON engineers in the earliest stages of design. FILTRON can furnish RF interference Suppression Filters which size, weight and shape will fit into your equipment.

FILTRON has custom designed over 1000 types of RF interference filters since many years. In addition to standard, FILTRON's special items are available for AC interference testing of your equipment.

An industry in process companies' technical
and service division



Integrated circuit and filter in wide band
RF interference suppression



Minimum 2 way -10 dB -100 MHz
Interference Suppressor 400 "W" x 1" x 9"

RF INTERFERENCE SUPPRESSOR LINE

- Resistors
- Capacitors
- Transistor Networks
- Active Components
- Diodes
- Amplifiers
- And other RF interference producing equipment



THE FILTRON CO., INC.
FLUSHING, LONG ISLAND, N.Y.
SOLICIT EXCLUSIVE MANUFACTURERS
BY INTERFERENCE FILTERS

AVIATION CALENDAR

Aug. 28—International Air Transport Assn. Women Congress special committee meeting, Reynolds

Sept. 10–Nov. 2—American Institute of Electrical Engineers' aerospace division meeting, Arlington Hotel, Englewood, N.J.; aviation paper, Aug. 10

Sept. 2–4—California Aviation Education Assn. annual meeting Los Angeles NASA, Long Beach

Sept. 5–6—Death panel investigation, Air Mart, Coast Huntington, Mass., # 1000, 16–17

Sept. 5–7—Symposium, "Progress in Solid State Electronics," sponsored by Institute of Radio Engineers, American Institute of Electrical Engineers, and Radio & Television Manufacturers Assn., organized by Dept. of Defense auditors, engineers at Roger Salkin Hotel, Washington, D.C.

Sept. 8—International Air Transport Assn. technical committee meeting, Gopon Hotel

Sept. 8–9—5th annual Wisconsin Aerospace Conference, Hotel Northland, Green Bay

Sept. 11—International Air Transport Assn. technical committee meeting, Houston Assn. Sept. 12–14—National committee on aeronautics conference, organized by Society of Radio Engineers' Defense section and Professional Group on Aerospace Electronics, Dayton Palace Hotel, Dayton, Ohio

Sept. 14—National aircraft committee, committee, Aeronautic Industries Assn., meeting, Hotel Statler, Washington, D.C.

Sept. 15–16—Society of Experimental Test Pilots annual meeting, Hotel Lorraine, Indianapolis

Sept. 15–16—American Helicopter Society annual Forum and Banquet, Hotel Washington, Washington, D.C.

Sept. 15–16—National Pilots Air Mart and Banquet, Cheyenne

Sept. 15–16—Institute of the Aerospace Sciences meeting, Cleveland Aerostatic section, Cleveland

Sept. 16—International Air Transport Assn. technical committee meeting, Rome, Italy

Sept. 17—Philadelphia Aviation Country Club annual spring regatta, Wings Field, Ardmore, Pa.

Sept. 18–19—Society of Automotive Engineers annual meeting, Ambassador and Ritz Carlton Hotels, Atlanta City, Ga. 3

Sept. 19–20—Council of military aircraft manufacturers' industry annual meeting, Hotel Statler, New York

Sept. 21–23—National Fire Protection Assn. annual meeting, aviation committee on June 18, Hotel Statler, New York

PICTURE CREDITS

- Top center: Courtesy, Douglas Aircraft Co.
- Middle left: NACA; 14—Courtesy, H. H. St. Cyr, Jr.
- Bottom left: Courtesy, Boeing Co.
- Bottom right: Courtesy, Boeing Co.
- Center: Courtesy, Boeing Co.
- Right: Courtesy, Boeing Co.
- Bottom: Courtesy, Boeing Co.

Just Published

A comprehensive, up-to-date guide for designers of rotisserie-wing aircraft—

Aerodynamics of the Helicopter

By Alfred Glaser & Jerry C. Morris Jr.

Written by two who did extensive work on helicopter aerodynamics, this book provides a detailed history and standard applied knowledge of helicopter aerodynamics. It includes all the physical forces involved and their influence on the helicopter's efficiency and stability, and contains a wealth of engineering formulas.

Among many valuable features, you'll find:

- Simple, accurate methods of performance prediction.
- Complete descriptive data of basic powerplants and how it may be determined.
- Detailed descriptions of the Flettner rotor system, both the helical and rectangular, and extensive data on the results of major research studies.

• Clear, simple explanations of basic static and dynamic stability concepts in terms of helicopter performance.

• Non-dimensional explanations of the major aerodynamic forces on the helicopter, including the effect of helical wings and airfoils, and the effect of tail rotor, engine, and airframe, during flight, hovering, and stability during landing.

• An extensive bibliography on continuing research, including a complete R&D index.

Are these helpful books on your working reference shelf?

* INTRODUCTION TO THE STUDY OF AIRCRAFT VIBRATION & FLUTTER

By Stanley B. Rosenblatt. An authoritative, nontechnical text and reference on aeronautical vibration and flutter. It covers the basic principles, techniques and data needed for the analysis of aircraft vibration and flutter problems, and includes a glossary of terms used in the field.

* Aircraft Drafting

By W.H. Tietrich. Introduces drafting not only as an art of准确度 and precision, but also as a means of solving engineering problems. It shows how drafting is used in aircraft design, and gives some specific models for the student to learn.

* Flight Testing

By Charles E. Chilton. Clearly explains and discusses the methods of flight testing, and gives step-by-step instructions for both conventional and jet aircraft.

See them on approval

The Macmillan Co., 62 Fifth Ave., N.Y.C. 11

Characteristics Please send me name, address and telephone number, and I will return the books in 14 days.

**Vibration and
Flutter** \$15.00

Flight Testing \$12.50



YB-61 GIANTS ALIGHT—Cessna's new nightjet YB-61 swooping bomber is seen as it takes off for the first time April 18 at Ft. Worth, powered by eight P-5W JST turboprops. In this early flight photo taken by USAF, leading gear has been eliminated by retarding

The Air Is Full of Giants



YB-61 FIRST FLIGHT—During YB-61 STATIONARY night P/W JST (not lit) the ground for the first time April 18, at Strategic Testfield, testbed, and leadoff at Lowry AFB, Denver, Colo. Landing gear has been touched out in this early flight view released by USAF.



Latest Photos of SAC's Big Bombers

B-56 CREW STATEMENT—Retouched flight view of late model Convair B-56 downed group of big bombers' 16 new members. The new stations are connected by 33th, powered jumbo. Lead-in: Lead-in: 1. Pilot commander, 2. Pilot, 3 & 4. Flight engineer, 5. Radar bombardier, 6. Navigator, 7. Nose gunner, 8 & 9. Radio operator, 10. Forward gunner; 11. Forward gunner; 12 & 13. Lower gunners, 14. Tail gunner 15 & 16. Upper gunner.

To the Operating Executive who must deliver personnel miracles

In today's tight—and growing tighter—labor market

The squeeze is on, but lessons learned "the last time" can serve you well today.

Here—in a book that's years for the asking—are dozens of proved-to-be-true ideas for personnel administrators. How to motivate your manpower. How to stretch available skills to expanding job requirements. How to spotlight weaknesses. How to maintain required records efficiently. How to increase overall productivity. In short, how you actually can stock員eaders under today's difficult labor market conditions.

Send today for Remington Rand's informative 88 page book "Personnel Administration—Records and Practices." You'll find it packed with informative facts on these vital subjects:

Application Forms and Inventories . . . simplified. Form screening of applicants. Cutting red tape.

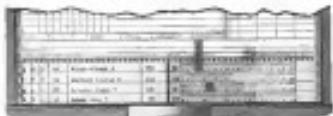
Job Analysis . . . matching people to jobs...time-saving techniques.

Identification Practices . . . spotting thefts and poor security risks.

Employee Rating Records . . . recording of the facts that affect cost ratings, job transfers, promotions, wage adjustments.

Payroll . . . manual and mechanized systems for handling payroll economically.

You've heard. That's all the more reason why you need new, better systems and methods now. Read the coupon today.



NEW! Exclusive KARLOK for Caliper-Accurate Signaling

Karloc records have always helped precision meet "the money"—get the best for the job, get New, with exclusive KARLOK, the newest form of Karloc signaling, you get even greater accuracy. Ask for a KARLOK demonstration at our Business Equipment Center in your city.



Remington Rand

Management Control Library, Room 1018

515 Seventh Avenue, New York 36, N.Y.

Please put me on your list for a free copy of:

- Personnel Administration (K201)
- KARLOK Signaling (ED-658)

Name _____

Firm _____

Address _____

City _____ State _____

WHO'S WHERE

in the Front Office

George A. Oregon has been made president and general manager of largest Canadian airline, Air Canada Macmillan MacBride at Montreal. A private pilot and director of the carrier since 1954, Oregon has served as managing director and general partner.

Edmund G. Alexander has been elected assistant vice-president controller of Australian Airlines and will head one of day-to-day controllers on the airline's division. He will base at Tokyo where he has been manager of production control for the past two years. Joseph P. Martin, who has been AA director of maintenance, becomes in effect the vice-president of maintenance and supply.

Lois T. Neal has been named vice-president controller of Soltex Aviation Co., San Diego, and **Herbert Kauzler** has been made senior vice-president/controller. Since joined the firm in 1947, Kauzler has risen to his new position. Soltex has been with the company since 1946 as a supplier.

Changes

R. G. Tolson has been appointed general manager of the Aircraft Turbine department of Fokker's division of Baldwin-Lima-Hamilton Corp., Edgewater, Pa., as addition to his duties as manager of the Division of power and heat departments.

Robert Ebdell, formerly with Convair Hi-Speed has been designated production manager of Avco's Reproducing Corp., Woodland, N.Y. Ralph A. Strode has been named manufacturing superintendent and Charles C. Riddle has joined the firm as production supervisor.

Robert R. Blackwell has emerged as editor of Aviation Age magazine effective May 1 to join Monsanto Chemical Co., St. Louis. He will be succeeded as editor by Robert J. Reed who has been the magazine's associate editor at Chicago. Blackwell (Hawthorne) also served most editor positions among others.

Jack Purcell has joined the Washington D.C. staff of IBM & Research Inc. and will devote his full time to the Avco Information Systems.

George E. Kotter has been named manager customer service department of Pacific Aerospace Corp., Richmond, Calif.

Walter Staples has been promoted to supervisor or manager of all production at Cincinnati, Tex., division of Texas Air Craft Corp. E. Paul Riddell has been promoted to manager of quality control and quality assurance for Textron at Dallas.

Tolton Warren has been named purchasing agent for Comairland-Vulcan Aircraft Corp., San Diego division.

B. B. Fischling has been designated manager of Tennessee Air Lines' third division, the state of Florida. Mandi and White, Jr. Bridge, formerly with CRA, has been made aviation division director of operations for TAL.

R. J. Zimmerman has been appointed sales and customer service area sales manager for Northwest Airlines.

INDUSTRY OBSERVER

Lockheed F-94L Strategic all-weather interceptor jet fighter production at Lockheed is equipped with off-pocket assembly-in-place of conventional aircraft components. Rockets, 24 in all, are mounted in banks of six and are inserted into the fuselage at a ring around the midsection of the plane. At a rate of a rocket per second, covering each bank of sixers would take 16 seconds. The fuselage housing the rockets for launching flares covering each bank may be opened independently or in series of three. Flying these Rockets are Mighty Maxes developed by Northrop.

Avia Canada CF-102 Jetliner, which has been used to flight-test equipment for Avia's CF-105 Canuck all-weather fighter, recently was flown to Cache, Colo., Calif. That city is headquarters for Boeing's aircraft which is developing and producing various variants for Lockheed F-104C and other all-weather fighters. Reportedly, Canada has not yet been able to find suitable radar equipment for the CF-102.

Pentagon Air Force personnel have received their field and base air wings Wright Air Development Center to put GF's new lightweight fighter prototype into production without risking its flying test of an unproven model, scheduled for October, says Dan Reiter. Until recently, the Pentagon had been indifferent to WADC recommendations to push the new fighter. *Defense Week* Feb. 4 (p. 11), despite pharmaceutical's own in flying tests.

A number of airlines have expressed interest in Fairchild's forthcoming long-wing C-117H Packet as a commercial cargo carrier and the company has high hopes of developing a civilian market. If present interest blossoms into airline orders, the company anticipates little trouble in gaining Air Force permission for commercial production.

Since major aircraft manufacturers are interested, present ownership and ILS navigation facilities will become the permanent system, not an interim step in developed by Air Navigation Development Board. Thus say ANDB and CAA planning far into the future that civilian development has proceeded along its own course and may lead to a direction not desired by the planners.

Consolidated Vultee Aircraft Corp. is conducting a new series of parasite fighter tests for Air Force. In this latest program to provide long-range bombers with their own escort fighters, a B-58 is used in another place to a Republic F-105 fighter. Tests are being conducted at Convair AFB, Texas. Air Force says only "several" launches of an F-105 from B-58 aircraft have been made to date.

British Royal Aircraft Establishment is laying close to its fatigue life of metal castings in British aircraft, and is involved in a recent Air Registration Board order that center section spars of Viking transports must be replaced after 10,000 flight hr. A long-range outcome of the RAE research may be that British manufacturers will have to build to more stringent requirements.

According to Bell Aircraft Corp., consensus is of "the nation's space station" for liquid rocket engines. Orders are believed to include GPC, Kerosene, Argon, Reaction Motors, North American Aviation and Curtiss-Wright.

Practitioner odds resulting from the seventh revised prediction rescheduling announced by USAF and NASA in delivery "stretch" through 1974. Early Canadian deliveries using Rockwell T-38 transports to USAF than private contractor Beech-Webite.

Canadian defense production sources say the first batch of F-50 Sabres built by Canadair Ltd. under license from North American Aviation and \$240,000 each plus rates from four airframes, while engines and other components imported from U.S. manufacturers cost \$75,000 plus dues and taxes per plane.

Washington Roundup

Air Power in Politics

Air power is in the thick of politics and it likely to be more so in the years gone. There is a choice the aircraft program might become. Prospects are:

- That the stretchout of production will be checked.
- That the 1952 aircraft plan by the House is held for the coming 1953 fiscal year, which starts July 1, whatever the final outcome.
- That USAF and Naval Aviation will be given a free hand or broad powers they already have for aircraft and other hardware already on order. On July 1, USAF and Naval Air will have \$20.3 billion in hand to spend for aircraft and related equipment already committed for.
- That it is Wise.
- The President's determined stand against House rather than defense funds.

The President's view of the House action, as a public address, "Did you say, 'Cut down on jet airplane production—or cut down on tank production—or reduce the number of men in the service—or provide them with less ammunition?' No, no, no. They didn't ask up to any of these questions. They don't take any responsibility for saying how we should sustain our national defense. Oh, yes, they didn't do that. They just took a knife and cut it and then they'd go out and hang about."

He continued, "Our national defense program can't wait on petty politics."

He went to keep Congress in action from now until January 20 and the defense choices of the House are reversed.

• Sen. Robert Taft's obligation to support at least the President's \$10.6-billion aircraft procurement program for next year. He is requiring the Administration to failure to put enough emphasis on air power, a promise of his presidential campaign.

Taft's comment in a campaign address, "What is our first priority? It gives eleven to me that it must be the building of an Air Force able to maintain control of the air over that continent and over the oceans that surround us because half the time in defense are bonds for the destruction of American bases, fuel, supplies, communications lines and overwhelming planes."

If we are reduced under global air control, we should be able, with our Navy and with some defended bases abroad, to prevent the extension of Communist power across water in all parts of the world."

• Sen. Joseph P. McCarthy's report of an power Chairman of the Appropriations Subcommittee now calling on the House period 1953 fiscal year defense appropriation bill, he wants to hold down defense spending—but not for air power.

• But the Politburo Might Mean

• A drag out fight between Congress and the President, with postulations as well as the defense budget the issue.

• That, as a result, funds for contingency aircraft procurement will be held up by just July 1, start of the fiscal year.

• That Congress might take a political course. Votes funds for air power, but put an overall ceiling on defense spending.

Potentially, this course would permit candidates to tell off power and then support it on the stamp and scale motions for scaling the aircraft production program.

USAF: Tactical Air Showdown

Air Force is doing legal haggling to avoid a showdown on the tactical air force—whether it should be called as an independent command in the field, whether it should be transferred to the Army, how much emphasis should be put on it in the air power buildup.

The last states that maximum USAF strength "shall not exceed 70 groups." Disagreement of Defense being heard when more stringent limitations regarding the working capacity is imposed by Congress. Comptroller of House Armed Services Committee:

Rep. Soule's Cut and certain committee members privately wondered what they would want on a thorough going of views on tactical aviation at speed hearings.

New USAF memo forth with an 18,000-word legal opinion which states that repeal of the law can't necessarily

USAF's position. "The 'group figure' was intended to establish such a performance target." It does not "reflect the freedom and authority of the Congress to appropriate funds for the expanded Air Force program."

Airline Battles Ahead

Scheduled airlines face Washington battles on:

• Establishment of Military Air Transport Service as a self-supporting independent enterprise, established with a revolving fund one of which it would pay costs, either for operating an over, less for contract operations, and be reimbursed by changes in rates. This would be also the pattern of MATS. See Transport Senate.

An Unprepared Army spokesman looks on the procurement as a campaign government activity which would best come if government traffic from the commercial lines had thus day into competition for transoceanic traffic.

• The battle of the lines. The Defense Department's cargo master, Assistant Secretary W. J. McNeil.

• Mergers of MATS and MTS. A House subcommittee, headed by Rep. Ralph Brown, would take this step.

Airlines are opposed because they want MATS centralized as a steady wartime training and military transport operation and not, as in the case with MTS, taking over non-military government transport business.

• Lack of competition. A Senate Small Business Subcommittee headed by Sen. Ross M. Mouly plays hearings and investigation to determine if there's enough competition in the air transport field.

The fall committee, headed by Sen. John Sparkman, will hold hearings to check on the status of the steadily existing and Civil Authorities Board's attributable to MATS.

The Small Business Committee is behind the resolution of their fall with the unchartered industry.

• Finance CAB's Administration plans to accomplish before long a program to finance the money system through tax changes. But there's also a strong move in Congress to require that tax changes be relative to finance the CAB operation through presents for certificates, dues for charter flight, penalties for evasion and the like.

Outlook of some members of Congress: Imposition of change might not fully finance the CAB operation, but it could be more efficient.

They point out: There might be fewer participants in CAB unless if there were a price tag on participation.

—Katherine Johnson

AVIATION WEEK

Mobilization Resignations Laid to Apathy

- Boyer, Bedford stepping out of key defense jobs.

- Air stretchout seen as contributing factor.

By Alexander McCauley

Mixed retirements were heard in Washington aviation circles with increasing the current turnover in top posts in the defense industry following the recent resignation at Defense Mobilizer Charles E. Wilson.

Behind general economic abstractions that the defense mobilization programs will still along and that major manufacturers are now highly energetic is a serious underlying concern about the "lack of urgency" in the White House and on Capitol Hill as manifested by the administration in air power buildup.

If the congressional situation was urgent enough in 1950 to call for a large-scale U.S. airways and cargo program, enhanced defense and mobilization efforts point out, while this has proved since does not justify the mobilization of a rate of 1,300 planes a year by the fall of 1953 to 1959. Under the adjustments cut in funds for aircraft and related procurement and the limitations clamped on expenditure rate by the House, Sparta estimated that the plane

• New Stand AF-Rome, Sparta

pointed out, has been able to expand and sustain the Chicago Committee with a force of 900 MCs at the point of impact in Korea and still take care of other requirements while the U.S., "the greatest air power in the world," has failed to 150 planes in the theater capable of meeting the MCs in combat.

He saw necessity for buildup of a "safe" capability of controlling the war" and having "enough doughboys" but goes an "over fast priority" because other forces won't be effective until we have an effective Air Force."

—John C. Gandy

Edgar Kamm as president of Chem-Aircraft, Inc., now in the process of moving to Wilkes-Barre, Mich.

Before his appointment last July to head the Aircraft Production Board, Boyer had been director of production engineering at General Motors Corp. During World War II he had been chief of Aerotow Manufacturing Board of War Production Board.

Boyer was executive vice president of Kaiser-Frazer Corp., last summer when he was loaned to Defense Mobilizer Charles E. Wilson to become Deputy Administrator of Defense. After defense administration ended, he became head of the Production Committee. About the first of the year, Chairman Wayne Dill Jr. was his replacement as director of Military Production in the Defense Department with return of Air Force to Defense Secretary Forrest.

• New Jobs—Dill tries once to get aircraft out of "soil-bound" and are now due to return to industry. Neither will return to the job he left, however. Boyer is expected to become general manager of a General Motors division, while Bedford is to succeed

Stretchout 'Inexcusable Risk': Spaatz

Opening a Senate door to increase the buildup of air power, Senate Preparedness Committee last week heard Air Force's first Chief of Staff, Gen. Carl Spaatz, now retired, insist the stretchout of aircraft production "is serious and unacceptable risk taken than a calculated risk."

"Instead of falling closer a stretchout, aircraft manufacturers should be required to meet a minimum production rate first," he told the Senate. "This is likely to be more reasonable, of which could spark off World War III—as long as we don't know if Air Force is making McStake think twice."

His Airline—Under the Administration's plan to postpone achievement of a 145 wing USAF from 1954 to 1955, but repeated, aircraft production will be reduced from a rate of 1,300 planes a year in 1953 to 1,250. Under the adjustments cut in funds for aircraft and related procurement and the limitations clamped on expenditure rate by the House, Sparta estimated that the plane

• Job lost west, Boyer told Airlines Week.

"The No. 1 scheduling block in military aircraft production is still the availability of special machine tools. Delivery dates run up into late 1953 and early 1954 for some of the tool and associated production will be held up accordingly. Financial shortages are in horizon and growing bad."

The APB staff and several sources on aircraft engines were just beginning to get into production and will be a major factor in overall aircraft powerplant problems before the end of the year.

• More Engines—Production currently is running at around 1,000 engines a month, mostly jets. Additional engine production, from automotive and aircraft producers will be phased into production of regular aircraft engine engines in a steady increase.

Chevrolet will produce its first

caused deposit at Sheboy, O. Another example: One type of office machine is purchased by the Air Force, but one of those same products is sold on New England and the third is in Detroit. All three are salaried over production of the three items being produced at Condit AFB just outside Los Angeles.

Cyrus also points out that these extra expenses will be reflected in additional cuts to the government in the form of allowable administrative costs. Not only will the contractor get back additional costs, but will obtain the same profit percentage as on the entire contract.

► **NAMR View**—In a cautiously worded statement, National Association of Manufacturers' Representatives, with headquarters at Dayton, adopt a "wait-and-see" attitude.

Spokesmen for NAMR said that the aircraft industry can be a partial solution to unemployment conditions, as reasons to keep the plant open will have on manufacturers and contractors who up to this time have been able to maintain complete contact by letter and telephone systems at Dayton. Manufacturers' and contractors' representatives, most of whom are engineers, have lost their experience and knowledge to buyers and ingurgitators at Wright-Patterson AFB in interpreting and evaluating specifications, drawings, proposals and quotations.

"Factions of manufacturers and contractors are wiser and varied a single point of contact for their services has been invaluable in aiding the defense program," said the (decentralized) association. It should have a representative to small business which presumably had a central point to obtain information concerning and subcontracting."

Reporting that CAA has reduced its employment by 31,000 since July, Lee said CAA now has 14,700 employees in government, Wright-Patterson, 1,200 regional headquarters, 2,041 field offices, 11,120 total.

Financially, CAA's employment looks like this: Operation of federal airports, 10,907; aviation safety, 3,613; and research development, 112. The remainder are divided between administration, 1,086, and miscellaneous staff and service offices, 836.

Bernhard Urges Use Of European Plants

The American aircraft industry should use the available productive capacity of continental European aircraft and engine factories to strengthen the defense of the Atlantic theater, says Prince Bernhard of the Netherlands.

In a speech prepared for delivery at the National Aerospace Meeting of the Society of Automotive Engineers last week in New York, Bernhard urged that about 5 million sq ft of factory space is now too productive, that 5,000-6,000 workers there will be idle for lack of orders during the next few years. And he underscored the fact that skilled labor is available in Europe on the northeast.

► **Other Proposals**—Bernhard made another effort to encourage better cooperation between the Europeans and American aircraft producers. He suggested that space parts for American aircraft specified by European firms could be built on the continent, thus reducing the time lag in parts procurement. Contingent design effects, and Bernhard, as shifting uses of magnetrons and inventive shields. Prototypes could be produced by different firms and tested on a competitive basis by test center placed at the disposal of the Atlantic community.

And he advised the American industry not fear competition from the continental markets in small outlets. "You will discover new opportunities for yourself, while at the same time you will strengthen the power of resistance of the Atlantic community as a whole."

Get as the Scrap-Ton Years in Defense



CONVAIR 340 GETS UP ON ONE ENGINE

Convair Latin America bought United Air Lines' second takeoff of four Lockheed F-104 Starfighters was staged for a contest in which had been won from Air Lines' first flight of 47,000 lb. Note post prop

French Leader Urges African Air Industry

(McGraw-Hill World News)

Plans Establishment of a large international aircraft manufacturing center in North Africa is being proposed to the North African Treaty Organization by French Secretary of State for Air Pierre Monteil. He expects the proposal to be given serious consideration at a NATO meeting later this year.

Monteil also discussed the proposal with U.S. Secretary of the Air Force Thomas D. White in Washington last February. He said it was calculated then to avoid the report of a mission of American aviation experts who will make a study that summer of Europe's aircraft leading aspects before going into further discussion of the project.

A survey by the American technical mission, Monteil said, certainly would reveal that Western Europe's current aircraft manufacturing facilities, even if used to capacity, could not supply all the planes needed for defense. He said his proposal would supplement existing production capacity by creating an integrated "European" aircraft industry far from the danger areas of the cold war.

Monteil proposed called for all members states of NATO to contribute to creation of this European aircraft industry—which naturally would be located in French Algeria or the French possessions of Morocco or Tunisia—for the purpose of boosting Western Europe's plane-building capacity in a period where the European NATO nations would be able to buy part strong air forces more or less independently of production from the United States.

Monteil proposed for all members states of NATO to contribute to creation of this European aircraft industry—which naturally would be located in French Algeria or the French possessions of Morocco or Tunisia—for the purpose of boosting Western Europe's plane-building capacity in a period where the European NATO nations would be able to buy part strong air forces more or less independently of production from the United States.

Wisconsin Students Get Flight Insurance

Flight insurance to cover students using as travel in connection with their school work is to be made available in the state of Wisconsin under a 1951 legislative act.

The legislature authorized the State Aeromotor Commission to act as agent for issuance of flight policies. An insurance firm has agreed to do coverage:

- Ten cents per \$1,000 per trip.
- Payment of medical costs up to \$100 per \$1,000 insurance for non-fatal injuries.

Several Wisconsin high schools and colleges have added flight field trips to their curriculums, but when had refused because of previous lack of insurance coverage.

Atlantic Coach

• **Airlines poised for first tourist takeoffs May 1.**

• **New ocean coach plans announced by carriers.**

Tours Atlantic air tourist service, planned to serve 100,000 or more passengers, starts this Thursday in after mid-night as competing airlines can get their planes in the air.

May 1 is the official opening date of the new service, agreed upon at New York, last December at a meeting of interested parties in International Air Transport Assn. And planning to start soon from New York very early in the morning of that date are El Al Israel Airlines, KLM, Pan American World Airways and TWA. Trans-Canada Air Lines will begin service the same date from Montreal.

DATTA, Inc., will launch the breakdown of the service on April 29, plane El Al. First flight westbound from New York, May 1, first flight from New York, Saturday morning. DATTA with two flights a week on each direction, will be operating until June 15. After that date, two will go Montreal, one via Boston. DATTA will use Constitution route 55.

• **El Al** Israeli Airlines. First flight eastbound from New York May 1. First flight westbound from Rome May 6. Will operate eight a week in each direction via Memphis and Milan, using DC-4s starting May 1.

• **PAA** Pan American will plan

first flight from New York, May 1, first flight from San Francisco, May 1, first flight from London, Paris and Brussels increasing to 12 in June and July. After that date, two will go Montreal, one via Boston. PAA will use Constitution route 55.

• **Sabena**. First flight westbound from Brussels May 1. First flight eastbound following day. Starts with three flights a week each way between New York, London, Paris, Brussels and Amsterdam, increasing to four June 15, six July 1. Until July 1 will use DC-4s; starting 44 transports, 16 Lockheed transports. After Aug. 1 will operate 15 services a week in each direction. Will use DC-8s starting Aug. 1.

• **Scandinavian Airlines System**. First flight westbound from Stockholm May 1. Starts with local flights a week each way between New York, Copenhagen, Helsinki, Stockholm, Copenhagen and Oslo, increasing to eight flights May 25 to Sept. 20. Will use DC-4s; starting 80 and DC-6s starting 50.

• **Swissair**. First flight westbound from Zurich-Friedrich May 1. Starts with one flight a week each way, adding a New York-Geneva-Zurich flight June 4. Will use DC-4s and DC-6s starting 50 until July 1, then more planes starting 55 and 35 respectively.

• **TCA**. Starts with seven flights a week each way, all departing at London, one a week at Paris, one at Glasgow and one at Shannon. Will use DC-4Ms starting April 25.

• **TWA**. First flight westbound from Paris, eastbound from New York May

Funds Delayed, CAA May Trim Payroll

A sharp cutback of Civil Aviation Administration salary funds and disallowance of more than 1,500 employee over the next two months was in prospect last week.

These factors were in the picture:

- CAA requested a \$31,500,000 supplemental appropriation to cover salary increases. Legislation raising pay of Federal workers was enacted after CAA's budget for the current 1952 fiscal year,

I start with seven flights a week each way between New York, London and Paris returning to 12. June 1 will see Grumman's service off.

All fares for the new tourist service are based on a New York-London round-trip rate of \$366 from April through October and \$417 from November through March. All major credit cards, except El Al and TCA, will continue to offer first-class air as well as tourist services. Those two will operate such tourist service planes across the Atlantic.

As far as passengers are concerned, the only major difference after this point between first-class and tourist service will be reduction of baggage allowance from 66 lbs. to 44 lbs. and a small charge for extra. TCA, for instance, charges about \$5.50 per bag. TWA's luggage loads of used tickets for \$4.00. Passengers may carry their own bags.

Convair Interest in Car Field Reported

Details word out whether the Convair Affair Kaiser-Frazer might well go through can be reported as about two weeks. Floyd B. Odlum, chairman of the board of Consolidated Vultee Aircraft Corp., told his board of directors last week:

•Plane Changes—Odlum declared that at the time of first conversations with Kaiser-Frazer (Aviation Week Mar. 18, p. 25) it was thought possible Convair would need a new plant to accommodate the company's 2,166 modifications and retroconversion contract with USAF.

Odlum, who also is president of the Avco Corp. which figures in the merger made the statement at a friend's talk to the director of San Diego meeting.

However, a new trend in the aerospace field gives in a published report under Odlum's experimental writer in the K-P International newspaper program. The report quoted Odlum as telling the directors: "If there isn't a good future in the automotive possibilities of the merger, it will be reconsidereed."

The statement came as a surprise to the aircraft industry and in some

of the Convair directors who have long known of Odlum's desire to form a so-called General Motors of the aircraft industry.

•AF Reacts—Air Force officials have been following the progress of the proposed merger with interest and feelings since USAF holds exclusive rights to the huge Kaiser-owned Willow Run facility and owns outright Convair's large Ft. Worth factory.

Some Air Force quarters have expressed satisfaction specifically over the proposed merger believing it would make cost-of-living problems less severe in research and development programs. Other quarters, however, deplored the fact an organization might have a dampening effect on the competitive spirit that now exists in the industry.

Odlum said a committee of directors has been appointed to determine the facts and merits of the merger. He pointed out that it is contemplated he and the committee keep informed data but that "it is expected that the studies will be held within the next two weeks." And he indicated he would be more concerned with the recent payroll of that time.

•Plane Changes—Odlum declared that at the time of first conversations with Kaiser-Frazer (Aviation Week Mar. 18, p. 25) it was thought possible Convair would need a new plant to accommodate the company's 2,166 modifications and retroconversion contract with USAF.

"We are now proceeding thinking in the Willow Run plant of Kaiser-Frazer would be usable in this respect. We found that the size of the plant for the job we had in mind is feasible, but that the plant was very unsatisfactory for manufacture of smaller量 aircraft and for wastewater other types of work."

He was asked their background, to which Odlum responded: "The aircraft and the aerospace considerations had developed.



PIPER TWIN-STINSON THRESSES ITS WINGS

The six-passenger Piper PA-38 four-engine light transport is seen in the air near its home grounds, Lakewood, Fla. Powered by two 153-hp Lycomings, the Twin-Stinson has been designed to sell for \$3,700 less than \$15,000. It is reported to go into production next year. It grosses 3,280 lbs., weighs 1,950 lbs. empty. Cruising speed at sea level is 150 mph; climbing rate 50 mph. Landing range is 720 m. Wheels provide slightly what is referred to take up shock in emergency wheelup landing condition.

Kidde Establishes Nuclear Energy Lab

Commercial application of nuclear energy is the primary objective of the Willow Kidde Nuclear Laboratories Inc., established recently as an 800 acre organization of other Kidde enterprises including Willow Kidde & Co. Inc., makers of fire protectors and power units, aircraft fire protection systems, aircraft interiors for aircraft.

The laboratories, the first privately financed group of its kind, will do its research, development and experiments.

Services of the firm will be available to other groups interested either

in design of nuclear energy power plants or application of nuclear technology to processes and products.

Technical direction of the lab will come from Dr. Karl G. Stroh, a prominent engineer in the field. Dr. G. E. Thompson, chief engineer for the lab, has recently been devoting much time toward the development of low-cost reactors for commercial application.

Development and engineering offices

of the new group will be located at 140 Cedar Street, New York, N.Y. Laboratories will be on Long Island.

The total staff of 30 scientists and engineers is expected to grow to 300 during the next one or two years.

Members of the company's board of directors: John F. Kidde, president; Walter Kalds Jr., Vice Pres.; Walter L. Kidde, Mrs. Cohen and Thompson; Harry K. Norris and William Galvin.

Australia Orders Pilotless Planes

(McGraw-Hill World News)

Melbourne—An undisclosed number of Australian-designed pilotless jet aircraft have been ordered by the Australian Department of Defense. Australia's Ministry of Supply will take a major part in the procurement.

The little aircraft has a span of less than 20 ft. It is powered by an Armstrong Siddeley Adder (Aviation Week Jan. 7, p. 25). It was developed by the government aircraft section of the Australian Department of Defense Production, Melbourne.

Although no figures have been released, the order is believed to cover a reasonably large number of the craft. They will be delivered to the Woomera long-range weapons station. It is reported that the plateau missile may be used during the test of the British atom bomb.

Put Your Stamp Back to Work

AVIATION WEEK, April 28, 1962

Die repairs eliminated

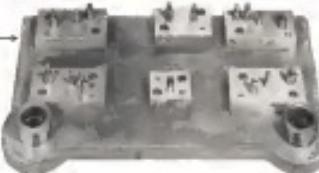
punch life increased

polishing of stampings no longer needed

... with dies made of Graph-Mo steel

Stamping our stainless steel parts for medical equipment S was causing trouble for the Petron & Crane Company, Detroit. The dies they were using—made of an ordinary steel—soon became worn after only a few hundred stampings. Holes in the parts were ragged, requiring polishing. The punches were continually chipping and cracking.

They tried dies made of Graph-Mo—one of four Timken® graphitic steel series. After 12,000 stampings, the Graph-Mo dies still showed no signs of wear. Striations were clean and exact. No polishing was needed. Petron & Crane report: "The fact that Graph-Mo stands up so satisfactorily, where other types we used consistently broke down, leads us to believe there is no



polishing of stampings no longer needed

better tool steel on the market today than Graph-Mo."

Graph-Mo offers many advantages in dies and punches. Because of its graphite in the structure, Graph-Mo has maximum tendency to soft or gall. Because it contains diamond-hard carbides, it offers unusual resistance to wear. Graph-Mo has excellent ductility. Surfaces may be finished to precision tolerance. Machining is far easier than with ordinary tool steels. And Graph-Mo's uniform response to heat insures precise distortion is low.

For further information, write on your company letterhead for new, 10th edition of Timken Graphite and Dies Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMBOSCO".

TEAMS AMIRE—THROUGH EXPERIENCE AND RESEARCH



TIMKEN
FINE ALLOY
STEEL
and Seamless Tubes

Graphite is an open-crystalline carbon and can withstand temperatures up to 2,200° F. Graphite is a natural deposit of silicate minerals and is usually found in veins and veins associated with metamorphic rocks.



**...AND ADAMS-RITE CAN SUPPLY
BETTER GROUND AND FLIGHT CONTROLS**

NEW DUAL CONTROL WHEEL DESIGN



Adams-Rite now supplies the most advanced and reliable control for both mobile and wheel and control surfaces. Adams-Rite's unique engineering and design provides a reliable and quick wheel assembly to your aircraft's need. Advanced and proven control features and good quality materials make Adams-Rite controls the best in the industry. Quality is what you can be counted on.

ENGINE CONTROL QUADRANT

The standard engine control quadrant is designed specifically for flight control applications. It features a unique precision of design that insures maximum torque and the best torque and response in flight control movements.



If you need an kind of a small, complex mechanism, especially one that is specifically developed by us to your requirements, or built to your specifications, let us quote on it. Adams-Rite has the experience, the facilities and the modern tools. May we hear from you?

QUALITY INSTRUMENTS FOR
MANUFACTURING CO.
MADE HALF A CENTURY

ADAMS-RITE MANUFACTURING CO.
345 WEST CHEVY CHASE DRIVE, GLENDALE 4, CALIFORNIA U.S.A.

REG. U.S. PAT. OFF.—GLENDALE 4, CALIFORNIA AIRPORT, LOS ANGELES, CALIFORNIA

Corp. transactions reported are: Floyd S. Bennett, Jr., officer, purchase of 116 common shares, total holding, Wilcox Products Corp.; Lee, Jr., director, purchase of 400 common shares, total holding, Frank R. Nichols, director, sale of 400 common shares, leaving a total holding of 1,680 shares.

Other transactions reported recently by corporate officials are:

- Air Industries, Inc.—William E. Decker, director, sale of 100 common shares, resulting in a total holding of 1,210 shares and sale of 100 preferred shares, total holding, Decker, leaving a total holding of 1,310 shares and sale of 100 additional shares, total holding.

- Air America, Airways — Charles W. Smith, officer, sale of 175 common shares, leaving a total holding of 1,175 shares.

- American Airlines — The chairman, Robert G. Allen, sale of 100 common shares, leaving a total holding of 1,000 shares; William T. Schlesinger, director, sale of 100 common shares, leaving a total holding of 4,200 shares.

- Air Transport Corp.—Edgar M. McCall, chief financial controller, purchase of 200 common shares, resulting in a total holding of 3,400 shares.

- American Eagle—Albert H. Roth, director, purchase of 100 common shares, resulting in a total holding of 100 shares; R. L. Peck, director, sale of 100 preferred shares, leaving a total holding of 100 shares.

- Pan American Airways—J. Franklin Johnson, director, purchase of 100 common shares, leaving a total holding of 100 shares; C. E. Williams, director, sale of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—Edmund G. Lovell, director, intention to purchase 100 common shares, leaving a total holding of 100 shares; John F. P. Murphy, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—William F. Johnson, director, purchase of 200 common shares, leaving a total holding of 200 shares; C. E. Williams, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

- Pan American World Airways—John J. O'Farrell, director, purchase of 100 common shares, leaving a total holding of 100 shares.

New DATA Chief
UAI Vice President Ray W. Ireland has been named Electronic Air Transportation Administrator to replace Paul Butler, who resigned to return to his job as president of Butler and Butler, Victoria, Chicago.

Put Your Strip Back to Work.



WILCOX ...Choice of EASTERN Air Lines

**Wilcox Type 429A Glideslope Receiver
Chosen for EASTERN'S Entire New Fleet of
Martin 4-0-4s and Super Constellations**

The safety and performance record of Eastern Air Lines' magnificent new fleet will depend upon the flawless operation of their ILS navigation system. In selecting the Wilcox Type 429A Glideslope Receiver as an important part of this system, Eastern paid a great compliment to the dependability and performance of Wilcox equipment.

The Wilcox Type 429A Glideslope Receiver provides 10/150 CPS tone modulated glideslope signals in the 329-335 Mc. range.

INSTANT ACCESSIBILITY FOR EASY MAINTENANCE

Routine inspection and service is made easy by the simple arrangement and instant accessibility of all tubes, components, and wiring.

AVAILABLE FOR D.C. OR A.C. POWER

The Type 429A is supplied for operation on either 25-mil. D.C. or 115-mil. A.C. 400-cycle current. D.C. or A.C. power supply couples the same physical space interchangeably. The right-side illustration shows the Glideslope receiver equipped for D.C. operation with dynamotor, and the left-hand photo is supplied for A.C. input. Thus it fits the requirements for all commercial, military, and private use.

*Write Today for complete information on the
WILCOX 429A GLIDESLOPE RECEIVER*



Right side



Left side

WILCOX
ELECTRIC COMPANY
KANSAS CITY 1, MISSOURI, U.S.A.



FASTER RESPONSE FOR GUIDED MISSILES



WITH

Bendix-Pacific
PACKAGED
SERVO SYSTEMS

Knowing how competitive you are in missile programs can cut your design expenses in electronics and hydraulics, Bendix Pacific has developed new missile control equipment with outstanding performance characteristics.

Illustrated is a complete "packaged" hydraulic system which receives remote signals and controls three servo valves for operating the missile control surfaces. It includes two solenoid valves, mounting cylinder, damping and safety valves, accumulators, pump, motor, and shield assembly. There are no external hydraulic lines and the component is a design evolved for an S/N of over 50,000 over all dimensions.

Bendix-Pacific has developed unusual techniques in producing precision servo valves and other units in economy - work stations held to within .00002". The unusual construction and low cost coupled with long service and savings in expense in developing hydraulic systems is a confidence that other missile manufacturers should help in their work.

Bendix-Pacific will develop complex control systems designed to fulfill your exact missile requirements. We can also supply individual servo valves, accumulators, shields and electronic units.

Complete information available to qualified companies.

Pacific Division
Bendix Aviation Corporation

WRITE OR CALL

Industrial activities

Automotive, Space, Communications, Defense, Electronics, Industrial, Manufacturing, Mining

AERONAUTICAL ENGINEERING



GYRODYNE 2c helicopter shows change from earlier version—lengthened fuselage, increased tail gap and revised landing gear.

Gyrodyne Model 2c Starts Test Flights

- New copter solves many coaxial rotor problems.
- But company sets sights on convertiplanes.

By Darril A. Anderson

Flowerfield, St. Louis, L. L.—The Gyrodyne Model 2c coaxial copter has entered the last phase of its evaluation flight tests for the Defense Dept.

Successful completion of these tests by the craft will mark first step toward eventual use of the configuration as convertiplane designs now on company drawing boards.

And Peter J. Papalas, president of the Gyrodyne Company of America, looks in limited production of the 2c design as the next step in the company's planning for the future.

► Evaluation Contract—The Defense Dept. contracted at June 1951, with Gyrodyne to flight test the coaxial configuration. In addition to flying the craft, the contract called for some results of the original configuration of a fixed tail fin for the rear rotor.

This tested out the GCA Control Helicopter, the development of a broad shaft steering mechanism before with the idea of Vincent Bondi.

Gyrodyne, which was acquired in 1946, bought in 1949 the assets of Heliocopter, Inc., which had been



GYRODYNE experimental prototype convertiplane shown in forward flight.

Bendix Hydromechanics, Inc. The company acquired the basic airframe which has since been flown both as helicopter and gyrocopter.

Since its earlier days, the Gyrodyne 2c has gone through several changes which have greatly improved the craft. Rotor gap has been reduced, landing gear has been strengthened, landing skid has been improved and hydraulic boosters have been added to the blade control system.

As a result, the 2c is almost a new aircraft.

The craft first flew on April 11, 1952, in its new guise. On that day, company test pilot Ken Ryan put in just short of an hour in the air. It flew again the following day, and the day after that. Then it went back into the shop for minor "tweaks" corrections and to iron things again.

► Design Reasons—Gyrodyne's 2c is as far as another from the top of an all-blade control system to the bottom of an

Co-axial Rotor Presents Possibilities . . .



MODEL 21 a cargo drone powered with Allison YW turboshaft.



CARGO POD for Model 21 is detachable, can be loaded while craft is down.



TRANSPORT design for 26 passengers carries over Heliodyne convertiplane scheme.

bright orange fuselage. It looks right, just as beauty is more than skin-deep, the coaxial configuration has some advantages over all other types.

Take one, for example. Maximum diameter on the coaxial layout is the rotor diameter. Such a config requires maximum mounting space, and takes about half the storage area required by other configs of equivalent capacity.

There is no power saving in the coaxial type. All the engine power goes directly to the rotors, none is reserved for auxiliary purposes.

There are disadvantages sometimes attributed to the configuration—these center on the rotor. One test on helicopter survivability says that the coaxial design is more complex, fails and controls, and wastes energy.

But a central truth of the new power is, survival basic engine is solar in the 2c and the manner of pitch control depends on feeling of disadvantage from the coaxial layout.

► **Rotor Details:** Two sets of tapered, saturated blades are rigidly connected and mounted on the rotor mast. There is one blade large, a so-called tip, for each pair of blades. Rotor disc diameter is 45 ft., and the gap between discs is 9% of that figure, or 5.3 ft.

At the bottom of the rotor mast is the transmission, shock-mounted in rubber vibration. There are also five gears—all spiral bevel-on—that transmission. The drive shaft is coupled to a universal joint between engine and transmission; at its transmission end is a spur gear which drives a larger gear. The second gear has a short shaft to a planet gear at the other end. This planet drives two gears which run counter-clockwise opposite direction. These counter-rotating shafts are the shafts for the rotor head.

► **Fuselage Layout:** The engine—a Pratt & Whitney R985 rated at 930 hp (and up to 1,200 hp when started in a bus structure which is the heart of the fuselage).

Virtually a box without top and bottom whose length is about twice its width. Engine is divided seven the middle of the long side. Then add a gap between the divider and one end. That gap is the basic fuselage structure of the Coaxiote.

For ventilation, the open portion of the box is the exterior rear section of the fuselage and carries the engine. The topped portion is the rear floor of the cabin.

A ring bellows structure runs from the divider and sets as firewall between engine and fuselage sections. From the front face of the box, two beams run liver forward. Between these beams, about half way to the front, there is a second bellows structure. This is the main support for forward landing gear.

All the fuselage frames are built in to



There's a new "heat" in this eagle's heart



To put more "thrust" in aircraft calls for an engine with ready reserve power. Now, with a new "heart"—400-horse size—

Lycoming precision production gives extra power for peak performance,

AN UNUSUAL DESIGN FOR HELICOPTER FAN PREDATOR, USES A TURBOCHARGED AIR-COOLED ENGINES (TAE) • DAY 600 PRODUCTION • 1960 PLATE NUMBER 100

LOOK TO

LYCOMING FOR RESEARCH
FOR PRECISION PRODUCTION

PROVEN IN SERVICE BY 400 AIR-COOLED ENGINES
MANUFACTURED SINCE 1946

Fenwal Over-Heat Detectors Protect Republic Thunderjet



FENWAL IN AIR FORCE POWER. Republic's F-84 Thunderjet, built for exceptionally high operational range, is equipped with Fenwal Over-Heat Detectors. These sensitive Type THERMOSWITCH® controls, which are specifically designed to meet the exacting demands of aircraft requirements and rigorous environmental conditions of every type of modern aircraft.



AS INSTALLED IN THE THUNDERJET, the Type 15185-34 OVER-HEAT Detector is a compact, automatically sealed THERMOSWITCH thermistor in which the shift in the resistance of the detector is proportional to the temperature. Accuracy and simplicity of construction are among the major advantages of this sensitively-prefused device for aircraft over-heat protection.



FENWAL QUALITY CONTROL INSPECTORS. Through functional testing and statistical inspection, Fenwal assures you that you're getting quality control instruments. A section of the most prominent control manufacturers. A modular high performance relay system, quantity delivery of all types of high accuracy controls. Fenwal offers you a wide variety of units that will last many years, any particular requirements, write Fenwal, Incorporated, 161 Pleasant St., Andover, Mass.

VOLUME PRODUCTION—PROMPT SHIPMENT. A section of the Fenwal shipping room, showing goods destined for some of the most prominent control manufacturers. A modular high performance relay system, quantity delivery of all types of high accuracy controls. Fenwal offers you a wide variety of units that will last many years, any particular requirements, write Fenwal, Incorporated, 161 Pleasant St., Andover, Mass.



THERMOSWITCH®
Electric Temperature Control and Detection Devices
SENSITIVE...but only to heat

Gyrodyne Model 2c (5-place)

Rated disc diameter	45.0
Disc weight	5.490 lbs.
Disc thickness	.3750 in.
Overall load	1.608 lbs.
Frontage length	35.0
Width at frontage point	32.5 in.
Overall height	64.0 in. 2 m.
Bowling collar (in ground effect)	31,000 ft.
Bowling rating (in ground effect)	5,000 ft.
Verified rate of climb	615 fpm.
Accelerative rate of descent	18.5 ips
Max speed, sea level	87 fpm/s
Climbing speed 1500 ft/min	74 fpm/s

The basic structure is the conventional nacelle fairing. The fairing is a sandwich built up on the hard plastic, although the top is a vinyl-coated construction and both open and closed structure.

Fairing Details. With the powerplants running at 100% of rated rpm, engine availability depends on a quick disconnect. The Gyrodynes disconnects alone to land, the fairing along in mid-air lane determined by the forward-leaning, bellied-in which serves a set of cage mounts.

There are four bolts at the break line; the control cables and the delivery line to the tail section are the only connections which must be broken.

With the fairing just taken off, the engine cowling is open for work. Overall height of the Gyrodyne is low enough so that most work in the engine section can be done from the ground. To work at the front section, or to reach across the riggers, the engine needs some clearance.

The oil tank and oil cooler are on the aft side of the inclined bulkhead at the break. Forward of the bulkhead and below it is the fuel tank, with a capacity of 100 gal. Engine exhaust ducts protrude through holes in the bulkhead and out and up into the atmosphere along the fairing sides.

Nose and Cockpit. You gain into the fuselage through two large doors, one each side of the forward landing gear. Pilot and copilot positions are roomy and well-planned. The current Gyrodynes have no further seating room, but the fuselage has plenty of space remaining for four passenger seats.

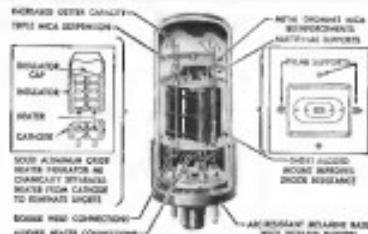
Although the cockpit is still forward of the wing pylon, there is no feeling of "tunnel" visibility. Because of the T-shaped instrument layout, it should be possible to add extra glass space on the lower forward fuselage section. This will probably be done after the first test evaluation has been made.

Landing gear is four-wheeled. The

BEAM POWER AMPLIFIER

ANOTHER RELIABLE ELECTRON TUBE SUGGESTED BY

ECLIPSE-PIONEER



We are not in the standard vacuum tube business, but we are in the business of developing and manufacturing reliable electron tubes for electronic equipment that will serve and meet the stiff and varied operational requirements of avionics, electronics, marine and other fields of modern industry. Typical of these are increasing type tubes such as Full Wave Rectifiers, X-Y Probes, Transistors, and Beam Power Amplifiers. Illustrated above and described below, all of these tubes are illustrated in the special catalog section under "Electron Tubes for Electronic Components," and are available in quantity quantities for a period of 10 years. In addition to the tubes described above, Eclipse-Pioneer also manufactures special purpose tubes in the following categories: qualified metal tubes, X-ray tubes, spark gaps, temperature tubes and voltage regulator tubes.

See our new PIONEER catalog section

RATING

Heater voltage (A.C. 110 V)	4.8 volts
Heater current	1.5 watts
Heater voltage (D.C.)	.500 milliamp
Heater current (D.C.)	.275 milliamp
Plate characteristics (max.)	10 watts
Screen characteristics (max.)	2 watts
Heater heater voltage	200 millivolts
Heater heater current	.1 amper
Wavelength	10 cm
Plate and screen voltage per stage (at rated conditions)	1000 volts

Typical Operation

Plate voltage	1000 volts
Screen voltage	200 millivolts
Heater voltage	4.8 volts
Heater current	1.5 watts
Heater voltage (D.C.)	.500 milliamp
Heater current (D.C.)	.275 milliamp
Plate voltage (max.)	1200 volts
Screen voltage (max.)	250 millivolts
Heater heater voltage	200 millivolts
Heater heater current	.1 amper
Wavelength	10 cm
Plate and screen voltage per stage (at rated conditions)	1000 volts

Physical Characteristics

Base	11/16" dia. x 1/2" high	Intermediate shell width 5/8"
Height	10.500 in.	10.500 in.
Base overall length	10.500 in.	10.500 in.
Base overall height	10.500 in.	10.500 in.
Intermediate shell width	5/8"	5/8"

Other E.P. products encompass servo mechanisms and computing equipment, spectrum & servo-measure and applied wave form generators, logic, solid-state integrated & carbon power supplies and various radiotherapy/beam-riding systems.

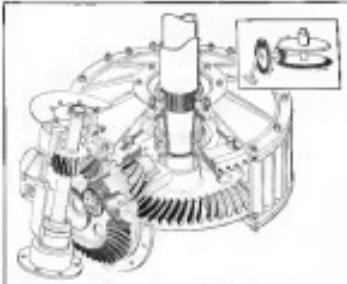
For detailed information, write to E.P.

ECLIPSE-PIONEER DIVISION OF

TETERBORG, NEW JERSEY



Export Sales: Results International Division, 29-55th Avenue, New York 11, N.Y.



Above: Five gas, oil and breather type turbine engine power to main rotor of Gyrodyne 2c, which here is opposite direction. Extra transmission is shock mounted to reduce vibration.

Left: Rotor head has numerous number of parts. Engine drive shaft passes right through universal joint to transmission. Rotor pitch control linkage is slotted and packed type.

two main shafts are rigid mounted to the sides of the enclosed gearbox, since gear has a large head. The forward gear fits into the bushings at either side of the fuselage box, and has casting-type wheels.

► Tail Cone—Structure of the movable tail section is conventional ring-and-strut combination. Because of the small loads to be carried, metal gages are minimized. Surface controls—comprising ground-adjustable stabilizer, and flight-adjustable rudder and rudder trim—are all-metal. They serve to add stability and control in the conventional flight planes.

Below is the station service and instrumentation. A translatable pedestal seats a one-speed, two-speed belt. The main electrical junction box is on the right hand side of the fuselage, below and behind the door sill.

There's one overall impression you get of the Gyrodyne, after you get past the idea of seeing two states where every other helicopter wears only one. That impression is one of extreme good looks. The Gyrodyne is a handsome aircraft.

That's an old saying in the aircraft design business: "If it looks right, it'll fly right." Apparently the Gyrodyne does by right, but even if it has a tough load ahead of it. Almost every other copter manufacturer has gone to the single rotor plus tail rotor, or the tandem rotor layout. With all the 2c's cited advantages it still seems a bit foolish had of heli-copters. That fact alone will make it difficult for some people to accept.

► Future Hope—The Gyrodyne people hope that after the 2c clears its flight test hurdles, the Navy will give the firm a multi-year service contract. That is the kind of job that Gyrodyne could handle nicely, because the rotor shop and supporting equipment is geared to a capacity of about a half-dozen or so aircraft.

But Gyrodyne is looking in the same marketplace as the future volume buyers for the 2c. The Model 21, as an earlier form, was built with two engine-pipetube combinations on nitrogen. It was an unanticipated rig, but it was a good one, and proved it proved the concept well.

The same basic scheme has been used in the foundation for a group of design proposals for commercial types. They all feature engine mounted out board of the fuselage in star wings which serve as auxiliary lifting surfaces at the flight speed inviscosity.

Such a design scheme should solve some of the problems inherent in the conventional.

► Transition Flight—What happens between the time the conversion begins at landing and the time it goes into level flight? How do we handle the station during transition flight?

With Gyrodyne's proposed layouts all you do in order to pitch changes and open the throttles of the outboard engines. There is a slight change at this—the aircraft shows very little of the nose-downing tendency to other helicopters in their transition from hovering to straight flight—and you are flying straight and level.

As you pick up speed, you do have to consider the rotors. Gyrodyne says that its proposals to attack the problem on the basis of the design speed range of the craft.

If top speed is going to be somewhere around 200 mph., it is all right to let the rotors rotate. As the speed is increased, the tip-sloshing factor seems to be the answer. You pull in the rotor due to a smaller diameter and due to the rotation with enough power to reduce this drag to zero.

In the range from 275 mph. to about 400 mph., the solution would be to let the rotors rotate and stop them. Gyrodyne proposes call for them to be located in a don-don position.

► Cargo Capacity—Gyrodyne has not neglected the straight helicopter split criteria of the overall metric, one of the most intriguing of these proposals is a huge cargo-carrying option.

The Model 21, as it is designated, carries the cargo in a detachable pod housing and availability of the cargo pod may be done while the Model 21 is hovering.

For some indication of size, Gyrodyne quotes a maximum overload lift coefficient of 12,300 lb. With this load, the range is 360 nautical miles.

Possibly the 100-ft. diameter rotors could house an Allison TH-410 bypass engine.

But the Model 21, and other proposals, must wait on the successful completion of the current flight test program. Gyrodyne has no plans for overnight manufacturing, the company

RYAN Answers RED HOT PROBLEMS

Leading stainless steel fabricator for the aircraft and aircraft engine industries

Consult Ryan on high-temperature metallurgy and ceramics.

JET ENGINE COMPONENTS

EXHAUST SYSTEMS

ROCKET ASSEMBLIES

AIRCRAFT and AERONAUTICAL PRODUCTS

RYAN AERONAUTICAL COMPANY
LINDBERGH FIELD, SAN DIEGO, CALIFORNIA

Fastener Problem of the Month

Position Locking Against Extreme Vibrations

April, 1952



PROBLEM: In the manufacture of products such as aircraft engines, necessary drive, shims, or vibration absorbers is obviously a necessity. Lock washers prevent unnecessary bearing, but frequently caused difficulty because their frequently caused difficulty bearing surfaces and their two plain installation consumed extra time. Alternative devices, such as safety-welded nut-bolt units and cap screws, involved tedious and costly installation procedures. And, because dependable protection against the loosening effects of extreme vibration was not assured, manufacturers asked for a more positive locking device.

SOLUTION: Some time ago, Western Gear Works standardized a long bolt with self-locking Elastic Stop Nut for this and similar applications. Because the inside diameter of the Red Locking Collar is smaller than standard bolt shoulders, both threads are grasped with a perfect fit, dampening the effects of vibration, preventing seizing the metal threads and eliminating wear play between the nut and bolt. And because the steel collar provides a dependably uniform torque, bolts can be accurately tightened. Since Elastic Stop Nuts lock in the bolt at any position, there is no need for safety locking devices. Western Gear Works found that installation and repair expenses operations were simplified and "wearing of the entire parts was eliminated."

ESNA[®]

YOUR FASTENING PROBLEM—Whether it concerns vibration, liquid storage, aircraft bolt loading or return—has an ESNA solution. Mail coupon for details.

Dept. M-323, Elastic Stop Nut Corporation of America
1210 Vassar Road, Wayne, Mich.

Please send me the following information on ESNA self-locking fasteners:

Elastic Stop Nut Bulletin

Have a drawing of our product. What self-locking fastener do you recommend?

Name

Firm

Street

City

Date

Date

seen an orderly growth in the future:
 ▶ Aerospace Shop—Currently about 60 employees contribute to the Model 7c effort. The factory area is 24,000 sq. ft.—looks like a model shop. There is just about one of everything needed to build small quantities of aircraft, including machine tools, metal working equipment, stock rooms and the like. Supporting departments—skid areas, blueprinting, woodworking—have been set up.

Convair has a case around which to expand. There is space at El Segundo for another plant, and there is room. The company executives, enough labor in the new to support that growth. They are as optimistic about the overall configuration and these findings are backed up by the tangible evidence of a respectable amount of flight time.

Convair to Develop Titanium Alloy Use

Jet pod gills may be the first article to use titanium after the result of a contract awarded to Consolidated Vultee Aircraft Corp. by the Air Force. It is significant that titanium alloy has been quickly taken up from the previous research work being done in the field of jet aircraft. Convair's contract, although to be one of the first awarded to an aircraft manufacturer for the developing of after-burner.

Titanium currently sells for \$12.50 per pound, considerably. It is strong and about 92% as heavy for equivalent strength. High-temperature properties of titanium are excellent up to about 2,000°.

It is extremely difficult to refine, the process has to be done under a vacuum, which partially explains the cost. But with the government subsidizing the manufacture of titanium alloy, there are hopes that increased processes will be created available and lower the cost.

Ceramics Research Efforts Pooled

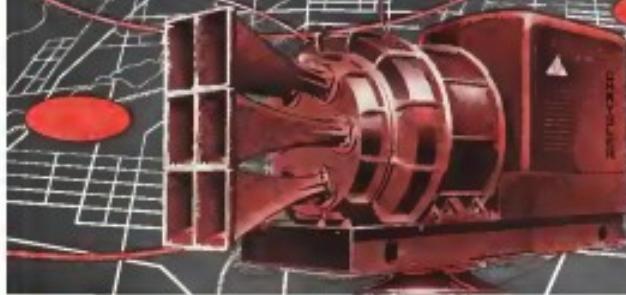
Ceramic coating research for high-temperature applications has received added impetus with signing of an agreement between Ryan Aeroplane Co. and California Metal Enveloping Co. to carry on a jointly financed program in this field.

At the same time, both companies believe that their improved ceramic A-150-Ryanite-G, is designed to operate under continuous temperatures of 1,600°F and remains unaffected by thermal shock encountered in exhaust systems between -70°F and 1,700°F.

Both companies' laboratories have been collaborating on ceramic coating research since early 1950.

AIRPORT WEEK, April 26, 1952

NEW CHRYSLER AIR RAID SIREN



Produces Loudest Sound for Defense Warning Systems

The Chrysler Air Raid Siren produces 158 decibels of sound 100 feet from the throat. It has a range of 8 miles. It produces the loudest warning sound ever produced for modern production.

The Chrysler Siren is independent of valuable electrical power systems as it is powered by the new Chrysler 180 horsepower V-8 engine. This siren power rotates the unit 360° every minute.

The Chrysler Air Raid Siren is now being installed in many principal cities throughout the country.

try because it is the loudest, most foolproof, most economical warning siren on the market. One city saved \$106,000 by installing Chrysler Sirens.

For complete information, specifications and availability for your city, town or industrial plant write Merlin and Industrial Engine Division, Chrysler Corporation, 12344 E. Jefferson Ave., Detroit 31, Michigan.



Assures Correct Layout for Your Warning System

Chrysler Sirens Technicians will help you plot your city map for correct coverage. Send us a geographical map of the area you need covered. We will plan your Siren Defense System for you! Write Siren Layout Service, Chrysler Corporation, 12344 E. Jefferson Ave., Detroit 31, Michigan.

CHRYSLER
INDUSTRIAL ENGINES

Geared for peak performance at higher pressures . . .



THOMPSON GEAR PUMPS



Pressures up to 800 psi. are handled dependably, positively, by the new Thompson Gear Pump. This pump is designed and built to handle today's jet-fuel pressures efficiently with negligible wear. As a plus, it's ready to handle tomorrow's higher pressures with the same high efficiency.

You're assured of the most efficient design and finest workmanship when you specify a Thompson Gear Pump. It's backed by years of experience in building fuel pumps and other accessories for aircraft . . . it's backed by Thompson pioneering and engineering, by Thompson metallurgical experience . . . and by the thousands of Thompson pumps in the air around the world.

Let us tell you more about the new Thompson Gear Pump and other accessories.



ACCESSORIES DIVISION

Thompson Products, Inc.

NUCLE, OHIO

YOU CAN COUNT ON THOMPSON FOR ENGINEERING LEADERSHIP



Gemaux IV Flies With Aspin I Ducted Fan

The Gemaux IV, one of a series of French light transport aircraft developed from a Republic seaplane, made its first flight recently, powered by a Turbo Aspin I ducted fan.

Gemaux is manufactured by Etablissements Faugé & Cie., of Aix-en-Provence, France. This is the first flight won Léon Bourges.

Aspin Basic.—The ducted fan is basically a shrouded propeller operating in a circular duct. Power to move the prop comes from a turbine which is the air resisting component of a standard turboprop configuration. Air for the turbine is bleed from the compressor duct of the standard propeller aircraft. Then there are two compressors, one driving air into the outer duct discharge and the outer one bleeding the air which has converted its energy from the propeller.

Flight tests of the engine set several amazing exhibition advantages of the ducted fan, largely surpassing on the Aspin currently totals over 1,000 hr.

Gemaux IV weighs in at 3,641 lb.



With a useful load of 850 lb., wingspan is 39.3 ft., length 21.7 ft., and wing area is about 375 sq. ft.

Aspin I is about 20 in. diameter, weighs about 310 lb. and has a thrust of 390 lb. Specific fuel consumption given as 6.6 lb./hr./lb.

Early, the new ducted fan has reported flight times so short that the fact that the engine is a very expensive gadget, indeed. In fact, the nozzle is believed to be an aspirator that we can and think of an overwhelming mass muscle with muscles many more than we can consider the same thing with super-hummers. The industrial supports, the logistics, the probable losses to enemy action, even able to make the reported cost of such an efficient motor than we can consider.

And when you look at the picture that way, you begin to see the appealing side of the economy required to support these future engines of war. There need to be a time when the proponents of the ducted nozzle argued that our main advantage was the low cost—in quantity, these things could be made very cheaply.

But that's not proved that important. Instead, the new techniques of manufacture, the new materials and

Faure is proceeding with Gemaux V which is to be powered by the more powerful Aspin II, rated at about 600 lb. thrust.

The Aspin is one of a series of Turbo motors engines which Continental Motors Corp. will build in the U.S.

A sensible target, you begin to see the cross-cutting of the aircraft, gearbox, engine, etc. The engine we consider non-maneuverable, anti-aircraft, tactic launcher-we supply various weapons. They hit the carrier, they shoot down its attacking planes, destroy his wireless sets, kill his troops. But as long as these are more planes, subs and torpedoes, these conflicts do not change the side of warship, except locally.

This gets back to the arguments in favor of strategic bombing. Destroy the enemy's leadership, and you knock him out of the war.

The enemy's leadership is made up of the propagandized areas that support him, his factory cities, his railroads and major ports. It is made up of his strategic areas, and his hydroelectric plants.

Knocking out the German and Japanese leadership during World War II was done with a variety of weapons—de-

precise ILS approach flying greatly simplified!



COLLINS Radio Company is now giving demonstration of a revolutionary new flight instrument System to airline pilots and technical personnel from coast to coast.

The purpose of the System, which has been under development and flight test for many months, is to give the pilot a clear picture presentation, on heavy instruments, of all the information he needs for precise ILS approach flying and enroute navigation. Only four instruments are required in the basic flight group diagrammed above . . . the two Collins Approach Directors, the Course Indicator, conventional altimeter and conventional air speed indicator.

Although complex VHF navigation and instrument landing information is required the pilot can rely on a

stainless steel or no possible source of confusion. Besides, there is a quick, easy picture of the aircraft's exact position with respect to the selected course, and ready follow-on steering directions for holding just the course.

The Approach Director, in addition to showing attitude, is an "anti-pilot" instrument. It tells the pilot D.O. he is keeping the plane correctly as it moves smoothly on course, or D.O. he is on course but moving correctly, or O.I. he is on course but flying in a manner that won't keep him there. Thus on final approach this single instrument presents all information necessary for making an accurate ILS landing without tracking the localizer course or maneuvering violently to get on the runway after breakthrough.



The horizontal bar of the Approach Director operates much the same as a standard artificial horizon. Peak of formation is shown by the system's wings and line of the airplane or the center of the indicator, which move up or down as the attitude of the aircraft is changed.

Displacement information with respect to the glide slope is obtained by noting the position of the pointer on the left in relation to the G.S. scale.

Horizontally displaced steering information for making good the localizer course is provided by the pilot by left or right deflection of the vertical pointer. To make good the course is not necessary for the pilot to maneuver the airplane — keep the pointer centered. Displacement is automatically compensated for by forcing the pilot to "crab" or sideslip to keep the pointer centered.

The Approach Director may also be used to good advantage in flying complex landings.

The Course Indicator provides the pilot with a clear picture of his position with respect to his chosen course, just as though he could see his course in a broad white line marked on the ground below.

This simple instrument presents to the pilot at a glance all the information which definitely must be maintained by monitoring the readings of several other instruments which the Course Indicator makes unnecessary.

The aircraft's compass heading is displayed counter-clockwise against the solid line in the top of the course menu.

Displacement information with respect to a selected course or localizer course is shown by the relative position of the small white arrow on the broad white line which represents the course.

Vertical information with respect to an enroute course appears as small white flags on the approach side of the altitude curve.

The GAI (Gyro Attitude Instrument System) displays the three dimensions of an aircraft's orientation — pitch, roll and yaw.

Adopted as the Collins Flight Instruments System will replace one of the instruments on the conventional flight panel and eliminate several others. This simplification of the pilot's controls requires no modifications, of course, but major improvements in the pilot's efficiency in maneuvering, more clearly, on ILS approaches, and in a manner that requires a minimum of interpretation.

A booklet illustrating and describing the operation of the Collins Flight System is now available. We will be glad to mail you a copy on request.

FOR BETTER INSTRUMENT LANDINGS, IT'S . . .

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street
NEW YORK, N.Y.

1727 Irving Boulevard
DALLAS 3



2009 West Oberlin Avenue
CEDAR RAPIDS
IOWA



You get All Weather Protection
with SMITH-MORRIS

Retractable AIR INTAKE SCREENS



A clear inlet is the best protection against obstructions by ice. Only retractable air inlet screens offer the advantage of a clear inlet for top performance plus the essential protection for axial flow compressors when on or near the ground.

And duct closing doors, as shown, can now be supplied for ground parking protection and reduction of drag in flight with inoperative engines. This exclusive Smith-Morris development offers appreciable overall weight savings when both screens and duct closing doors are required.

Smith-Morris Company
AIRCRAFT AIRWAY MANIFOLD SYSTEMS
GAS TURBINE PARTS AND ASSEMBLIES
FERNDALE 26, MICHIGAN

quadra, high-explosive, fragmentation bombs, step and lead-based and low and the atomic bomb.

The ultimate guided missile is a single-purpose weapon which can be effective against any one of these targets at a distance. It must be able to destroy the target completely, rendering factory, foundation and infrared into rubble.

And the way it looks now, the ultimate missile is a longrange, rocket-powered craft which carries a small atomic warhead. At the target, it dives deep into the earth and explodes. The resulting mushroom earthquake destroys the area as completely as Genghis Khan's men did. Another critic:

Such a missile using current tech would probably have three stages to get the necessary velocity, which would sacrifice range. It might not have to have pinpoint accuracy, because the size of its crater could be large enough to allow a reasonable proportional error. It would cost lots of money to build, set up and launch.

In sight—at the firing stand and ready to present itself to such as SS missile per cap. But in a variety of ways would return their initial investment many fold.

This seems to be the ultimate guided missile—DAA.

Plan Seminar In Aeroelasticity

A special seminar course in recent developments in aeroelasticity is scheduled for July 14-22 at the Massachusetts Institute of Technology. Program will be directed by Prof. R. L. Higdonhoff who is in charge of aerelastic and structures research at MIT.

The review is planned toward the application of the engineer in a related field.

The course will include an introduction, classification of aeroelastic instabilities, review of the problems, theoretical solutions of practical problems and the use of dynamic models and wind-tunnel testing.

Living accommodations will be available for those requesting them in application for the course. Address: Dr. Ernest H. Hartman, Director of the Sommer Seminar, Room 3-307, Massachusetts Institute of Technology, Cambridge 39, Mass.

Jet Cooling System Wins Company Check

The invention of a gas-turbine compressor housing air cooling of the outer compressor will bring a \$5,000 check and special recognition recently to Ernest F. Miller, veteran Steam division

Radiography checks—



then double checks

LANDING GEAR STRUTS lead a life of punishment. Though light, they must be strong. Their joints must be sound. Radiography is the method used to prove them sound.

A nature of neophyte aeronauts goes even further. Though treated and sealed, strut members can develop internal corrosion and become weakened. Radiography alone can provide the required non-destructive examination of these internal surfaces. So it has become routine to x-ray these struts as part of the periodic inspection of the planes.

This is but one example of how radiography is proving a boon in the welding process. It is helping to open new fields for the use of welding—especially in the fabrication of highly stressed products and assemblies.

Look into the ways Radiography can aid your business. Your x-ray dealer will be glad to give you full information and assistance.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N.Y.

Radiography—

another important function of photography

**Produced
to rigid
aircraft standards**

Shelby Seamless Aircraft Tubing

SHELBY AIRCRAFT TUBING can be machined with ease, and it can be bent and shaped into almost any form. You can weld it onto the most complicated parts, yet be sure that these joints will be 100% efficient. Made specifically for aircraft use, this tubing embodies, to the highest degree, the factors of workability, strength and safety.

Shelby Seamless Aircraft Tubing has been incorporated in aircraft design even since the industry started in the country. Our constant research program has developed the use of new and stronger steels, improved heat treating methods as well as superior inspection techniques that insure the highest quality tubing.

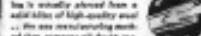
When you plan your future requirements, be sure you get all the facts on Shelby Aircraft Tubing. It is produced to rigid aircraft standards by the world's largest manufacturer of tubular steel products.

NATIONAL TUBE DIVISION
UNITED STATES STEEL COMPANY, PITTSBURGH, PA.
(TUBING SPECIALISTS)

EUROPEAN BRITISH DIVISION, SAN FRANCISCO, PACIFIC TRADE REGISTERED
60774 TUBE TUBES, CAPRI COMPANY, NEW YORK



All Shelby Seamless Aircraft Tubing is carefully checked from a combination of high-tension visual inspection and ultrasonic testing to make certain that it carries all desired assuring qualities and strength.



U-S-S SHELBY SEAMLESS Aircraft Tubing

UNITED STATES STEEL

chief engineer of the Westinghouse Electric Corp.

In a brief presentation ceremony, Mr. Gandy A. Pace, president of Westinghouse, said that the "... invention has so far been used in several million dollars worth of jet engines that have been delivered to our armed forces. We expect to go into our \$100 million worth of jet engines every year."

The description of Miller's invention says that the combustor is made of telescoping circular sections that allow sideways load to be taken at the outer surface of the combustor shell.

NACA Reports

► Theoretical Force and Moments Due to Slewing of a Nascent or Vertical Tail Configuration. See NACA Report 1341, by John C. Mathis and Frank S. Melville, Jr.

Slewing flight of research airplanes, such as the Douglas D-552 2 Skyknock, has pointed up the seriousness of the dynamic stability problem. Theoretical analysis of the problem has too often lagged flight test of the aircraft. For instance, information is lacking on the likely derivatives contributed by the vertical tail.

This paper reports a theoretical analysis to determine lateral force, yawing moment, and rolling moment due to slewing for a series of tail configurations. These tails are characterized by supersonic leading edges. They can consist of vertical surfaces mounted symmetrically on a horizontal tail, the vertical plan form may be either by angular rectification, or of rectangular configuration.

Linearized theory is used to analyze the derivatives; therefore, only first order derivatives are obtained. Results are presented to cover where the leading edge appears, and the Mach line lies on the tip of the leading edge; if the vertical tail does not subtend the root section (tailplane) of the wing, or, if the tail derivatives has not been considered.

And the authors note that reduction of the linearized flow theory limits the usefulness of the results for full-scale flight stability calculations. It appears that theory will lag flight tests.

► The Stability Law for Hypersonic Flow About Shells. Three-Dimensional Shapes (TN 2445). By Frank M. Harman, Stanford E. Nemer, and A. J. Eggers, Jr.

This paper is a further study of the hypersonic stability law first developed by Taito in late 1946. Taito's development was for thin surface-to-surface

**NEW PRE-MOLDED
seal caps
PRODUCE TIGHT**

Integral Fuel Tanks

AT GREATLY REDUCED COST AND WEIGHT

This new method of sealing bolt heads, nuts and various types of rivets in integral fuel tanks provides three clear primary advantages: (1) Fuel tank strength is increased through elimination of washers or air pockets in standard sealing; (2) Reduced weight by elimination of insulation required around bolts; (3) Reduced assembly and maintenance costs through faster application and elimination of sealant waste. (4) Shorter sealing time through elimination of the time-consuming series of brush coat buildups (Refer diagram below.)



This shows a brush coat application. It is a time-consuming process for the fuel tank.

BRUSH BUILD-UP METHOD



Performance disadvantages to this procedure are: (1) Thickness of insulation is required to insulate motors from the heat of the fuel tank. (2) Weight of sealant waste (an unnecessary weight) which increases weight of the aircraft. (3) Insulation may have voids in it, causing insulation to become dislodged.

SEAL CAP METHOD



Preferred seal cap method eliminates the application of excess. This provides a waterproof seal. The seal cap is a one piece, thermoplastic dome which is held firmly in place by heat shrinkage. Seal cap is reusable.

A free copy of Engineering news, No. 10, 1960, is available upon request.

PRE-CAST, INC.
3626 San Fernando Rd., Glendale 3, California
4 Million Pounds Productive Capacity

SEAL CAP
PRODUCTION DATA

OTHER PRC INTEGRAL FUEL TANK SEALANTS

- P-10: Polyurethane sealant for fuel tanks, serving as lining
P-11: Two-part polyurethane sealant
P-12: Two-part polyurethane sealant
P-13: Epoxy sealant and seal film
P-14: Epoxy sealant and seal film
P-15: Pressure sensitive bonding material
P-16: Epoxy resinous thermoset compound
P-17: Epoxy resinous urethane sealant
P-18: Graft copolymer

FIRST AID FOR procurement



WITEK
HOSE CLAMPS
We have 250 complete
line hose press
assemblies.

AH 741
HOSE CLAMPS
Types "A" and
"B" in Lead and
Aluminum. Includes
Delivery.

PARKER
FITTINGS AND
TYPE "A" AND
"B" HOSES
Also Components and
Tools for Assembly
Tools.

AH HARDWARE
PACIFIC EXIMCO
has
Received Stock of
Bells, Masts, Windows,
Screens, etc.

ALCOA
ALUMINUM EXTRUSION
SHEET METAL
Also Sheet Metal
and Special Parts

CHERRY
SHEET METAL
Also Sheet Metal
and other Aluminum
Tools.

INSTRUMENTS — DIALS — ACCESSORIES

Our independent laboratory is fully equipped and staffed with highly skilled technical experts in assembling and classifying the most diverse precision instruments. Our Test Shop produces both CAA and Bureau test results rapidly and expertly. Units can be supplied in either metric or English, using basic or International patterns. Our extensive test facilities include the following: Strength, Dynamic, Pressure, Free-Swinging and Electrical testing.

CAA APPROVED REPAIR STATION NO. 2783

STANDARD PRODUCTS, INC.



Wholesale Distributors for Leading Manufacturers
PHONE 3-1421 • 400 EAST WISCONSIN, MILWAUKEE, WISCONSIN
TODAY'S BUSINESS PROVES TOMORROW'S LEADERSHIP

PROBLEM

Regardless of the number of your applications, you can depend on persons and their much-valued experience to meet all your needs.
The A. W. Haydon Company



timing



SOLUTION

To assist you in solving your timing problems, the experienced know-how of the A. W. Haydon Company is devoted to expeditiously fulfilling your requirements.

WRITE FOR CATALOG

A. W. HAYDON
COMPANY
2214 N. KELLOGG AVENUE
MILWAUKEE 1, WISCONSIN
TELEGRAMS: HAYDOON 2-7700

and slender non-lifting bodies of revolution.

Further extensions and applications of the similarity law have been made in the past. Yet the NACA thought it would be desirable to determine the exactness of the law for slender three-dimensional bodies of arbitrary shapes. And, of course, this development would be in terms of the aerodynamic and dynamic parameters. The types of shapes selected were wings, bodies and wing-body combinations.

It was possible to get a limited experimental check for bodies of revolution by comparing pressures measured on two backed cones at related angles. For these special cases, theory and experiment were in good agreement except for the lee side of the cone.

The authors suggest that the range of applicability of the law appears to warrant further investigation. They feel that if this range is relatively as wide as the corresponding range for streamlined bodies of revolution, then the law should prove of value in correlate experimental data. And it should be possible to simplify further theoretical calculations of the aerodynamic characteristics for families of these particular shapes.

► **Analytical Method for Determining Performance of Turboprop-Engine Tail-Pipe Heat Exchangers** (TN 2450)—By Michael Rehm and Horacio C. Chodorkoff, Jr.

The use of a tail-pipe heat exchanger offers some interesting possibilities as a source of heat for thermal energy extraction of turboprop aircraft. Such a heat exchanger consists of a channel surrounding the tail pipe of a turboprop engine, this in opposition to the flow of air through the tail pipe. Therefore, this heat exchanger appears to be the least harmful method of extracting energy from a turboprop engine.

This particular investigation is part of the NACA's general study of the effects of extracting energy from several points in the turboprop engine cycle. The method presented can be used to estimate performance of an unducted tail-pipe heat exchanger of the parallel-flow type. Results are presented in the form of generalized weight charts for a wide range of flight conditions.

One such example, calculated for a 6-ft long heat exchanger on a turboprop engine without after-burning, showed a heat output of about 780,000 Btu per hour. This heat output was obtained with an engine performance reduction of 3 percent on the order of 2%.

Comparing the performance of ducted and unducted heat exchangers indicates that the enclosed parallel-flow type is probably preferable. This is because of (1) lighter weight and simpler construction. —DAA

Another FIRST for the Air Force and Convair



Convair's YF-102A
Air Force's first jet fighter
—YF-102A. America's
first transonic fighter. All-new
Convair-Turbolent, nation's
fastest fighter ever built.
FAN, world's 1st water-cooled
canopy plane. And now,
the transonic YF-102.



America's most experienced manufacturer of turboprop aircraft will build the first turbo-powered training planes for the U.S. Air Force. Already the producer of the Air Force's most advanced multi-place transport, Convair now is further broadening our power by making its even more modern turboprop "Twin Convair" for navigation-trainer duties. Training maximum in turboprop YF-102's will 20% the closest possible simulation of tactical problems.

Turboprop YF-102, like all Convair projects, will develop strength supplements that come in the maximum, the 8th degree of air power. —*The NY Power*

ENGINEERING TO THE *N^o* POWER



IN THE AIR IT'S
CONVAIR

Convair is a division of General Dynamics. See Dept. E Powers, Industrial, East Park & Rosedale, San Diego 6, California.

GENERAL DIVISIONS IN ADDITION TO MILITARY AIRCRAFT ARE ITS PLANT FACILITIES LOCATED IN TOTAL OF MORE THAN 4 MILLION SQUARE FEET DEVOTED TO RESEARCH AND PRODUCTION PROJECTS FOR AIRCRAFT DIVISION, MISSILES AND ELECTRONICS.

UNIVERSALLY ACCEPTED

the largest
resistance welding
machine manufacturers
in the world

SEI AKY
4915 West 51st Street
CHICAGO
Plants at Lynwood, Park

PRODUCTION



CANBERRA LIGHT BOMBER, with two squadrons in service, is one of the six or seven planes Royal Air Force is using.

British Bank on 'Super-Priority' Plan

This gives certain aircraft types top position in UK economy, but observers wonder if it will really work.

By Sue McKitterick

(McGraw-Hill World News)

London—Consent and authorization for us or areas of Britain's newest aircraft will get first call over exports, other defense needs and house production, aircraft, radios, electronic gear, scientific, medical and other industries even compete for new labor, in order to get Britain's aircraft production programs off the ground.

► Super-Priority—This is how the Ministry of Supply has defined "super priority" which Prime Minister Churchill has allotted to the needs of the RAF. Aircraft eligible include the Hawker Hunter (F.100), the Vickers Valiant, the Fairey Gannet, the English Electric Canberra and "the all-weather fighter." This last refers either to the Gloster delta-wing GA.5 or the de Havilland DH.116—or to both. The MoS has yet to decide which one it wants.

Of the planes on the super-priority list, only the Canberra is actually in production—and that at only one of four factories slated to produce the dual-light bomber. All the other producers are still in the early tooling-up stage. By keeping the best of these eligible for super-priority, MoS hopes the donor will really have some effect. The list also includes the Avro Lancaster, some specialized aircraft, expansion and padded reserves. ► Hopes—Tinged—but, hope we

tempered by the hard facts of machine tool shortages, shortage of skilled labor, and design troubles. Except the Gannet, two squadrons of which are already in service, most of the other craft are likely to be in service in any event by 1957. More important is the fact that since it started, the aircraft industry's labor needs have increased by more than 50 percent. Said MoS, "we estimate needs 75,000 more workers—but character are they can't all be employed before early 1953."

One thing every superpriority isn't going to do much about is the lack of a few key machine tools, needed in the U.S. in 1951, which MoS says threatens to hold up the progress all along the line.

Example: Those specially designed Centrifugal Hydrostats are normally used anyway to get Centaurus production started at the three major subcontracting firms—Hawker-Siddeley, Hunting-Short, and Armstrong Whitworth. And there are other examples involving Machinists, jig houses, vertical lathes, and large lathes.

The Hydrostats, most serious bottleneck, won't likely be the greatest von Centaurus holding the tool specially for the British. During the early part of this month, Mutual Defense Agency was to appear in the National Production Authority for discussion of some of the other tools—such as USAF stocks—to help the British get started.

The British aren't very hopeful of getting quicker delivery dates from the

U.S. W. G. Peden, head of MoS aircraft production division, told Aviation Week, "If we are going to wait for U.S. delivery date, we won't ever get our program going even with superpriority." Huskey hopes that the key tools involved would be up about 15% of the \$412 million worth of tool orders Britain has placed in the U.S. But only a tenth of that 15% has been delivered.

Packay urged the British industry to look for alternative methods to make machine shop bottleneck, even if they entailed "considerably more expense." He said manufacturers look enough to have the ingenuity needed tools to make them 140 hours a week or more.

► Long Lead-Time—Data for aircraft in Britain have been lengthening increasingly, and the lead has at that super priority will at least stop the trend. In a report to a House of Commons committee recently, MoS figured it now takes 23 to 24 months to get a new type of aircraft into service. Last year it took 11 months, and the two years ago.

Example: Those specially designed Centrifugal Hydrostats are normally used anyway to get Centaurus production started at the three major subcontracting firms—Hawker-Siddeley, Hunting-Short, and Armstrong Whitworth. And there are other examples involving Machinists, jig houses, vertical lathes, and large lathes.

The Hydrostats, most serious bottleneck, won't likely be the greatest von Centaurus holding the tool specially for the British. During the early part of this month, Mutual Defense Agency was to appear in the National Production Authority for discussion of some of the other tools—such as USAF stocks—to help the British get started.

► All-Weather Go-Ahead—The introduction of the "all-weather fighter" in the superpriority list points up a recent change in Al Ministries plan. Up to now several units go into a half dozen or so GA.5 and DH.116 were

Eastern's NEW Great Silver Fleet



Eastern's NEW Great Silver Fleet. From top to bottom, the New-Type Constitution, Super Constitution, and Silver Falcon.

uses SINCLAIR
Aircraft Oils!

. . . 4th year of exclusive use by Eastern!



Eastern Air Lines has proved Sinclair Aircraft Oils outstanding through millions of miles of air travel.

No wonder, then, that Sinclair Aircraft Oils are used exclusively in Eastern's new, Great Silver Fleet — including the magnificent new 82-passenger Super Constitution, the New-Type Constitution, and the new Silver Falcon.

Yes, Sinclair lubricants reduce costs and provide fine, safe aircraft engine lubrication.

Why not interest your important lubrication needs to Sinclair Aircraft Oils... preferred in the laboratory power in the sky?

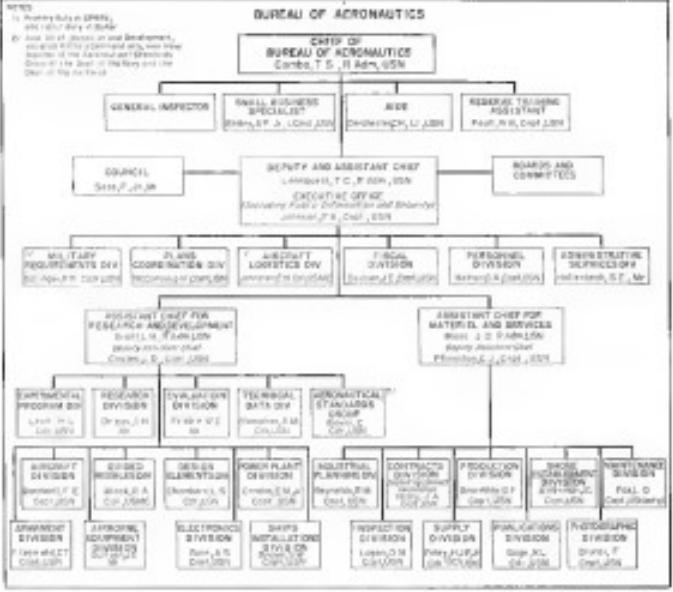
SINCLAIR AIRCRAFT OILS

Sinclair Refining Company
Aviation Sales, 600 Fifth Avenue, New York 20, N.Y.

FACTS FOR FILING

1. Promoting Safety in SPHERES
and Safety in Space

By Assessing the Process and Development
Environment of the International Space Station
to Ensure the Success of the Safety and Health
Objectives of the ISS.



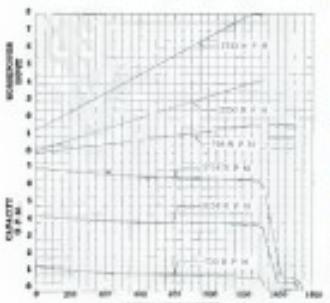
International & Domestic Scheduled Airlines								
Year	Domestic Revenue (\$ billions)	Domestic Passenger Mileage (billions)	Domestic Passenger Revenue Per Mile (\$ billions)					
1980	—	—	—	—	—	—	—	—
1981	1.7	10.7	0.16	0.16	0.16	0.16	0.16	0.16
1982	2.0	11.0	0.18	0.18	0.18	0.18	0.18	0.18
1983	2.1	11.4	0.19	0.19	0.19	0.19	0.19	0.19
1984	2.3	11.7	0.20	0.20	0.20	0.20	0.20	0.20
1985	2.5	12.0	0.21	0.21	0.21	0.21	0.21	0.21
1986	2.7	12.3	0.22	0.22	0.22	0.22	0.22	0.22
1987	2.9	12.6	0.23	0.23	0.23	0.23	0.23	0.23
1988	3.1	12.9	0.24	0.24	0.24	0.24	0.24	0.24
1989	3.3	13.2	0.25	0.25	0.25	0.25	0.25	0.25
1990	3.5	13.5	0.26	0.26	0.26	0.26	0.26	0.26
1991	3.7	13.8	0.27	0.27	0.27	0.27	0.27	0.27
1992	3.9	14.1	0.28	0.28	0.28	0.28	0.28	0.28
1993	4.1	14.4	0.29	0.29	0.29	0.29	0.29	0.29
1994	4.3	14.7	0.30	0.30	0.30	0.30	0.30	0.30
1995	4.5	15.0	0.31	0.31	0.31	0.31	0.31	0.31
1996	4.7	15.3	0.32	0.32	0.32	0.32	0.32	0.32
1997	4.9	15.6	0.33	0.33	0.33	0.33	0.33	0.33
1998	5.1	15.9	0.34	0.34	0.34	0.34	0.34	0.34
1999	5.3	16.2	0.35	0.35	0.35	0.35	0.35	0.35
2000	5.5	16.5	0.36	0.36	0.36	0.36	0.36	0.36
2001	5.7	16.8	0.37	0.37	0.37	0.37	0.37	0.37
2002	5.9	17.1	0.38	0.38	0.38	0.38	0.38	0.38
2003	6.1	17.4	0.39	0.39	0.39	0.39	0.39	0.39
2004	6.3	17.7	0.40	0.40	0.40	0.40	0.40	0.40
2005	6.5	18.0	0.41	0.41	0.41	0.41	0.41	0.41
2006	6.7	18.3	0.42	0.42	0.42	0.42	0.42	0.42
2007	6.9	18.6	0.43	0.43	0.43	0.43	0.43	0.43
2008	7.1	18.9	0.44	0.44	0.44	0.44	0.44	0.44
2009	7.3	19.2	0.45	0.45	0.45	0.45	0.45	0.45
2010	7.5	19.5	0.46	0.46	0.46	0.46	0.46	0.46
2011	7.7	19.8	0.47	0.47	0.47	0.47	0.47	0.47
2012	7.9	20.1	0.48	0.48	0.48	0.48	0.48	0.48
2013	8.1	20.4	0.49	0.49	0.49	0.49	0.49	0.49
2014	8.3	20.7	0.50	0.50	0.50	0.50	0.50	0.50
2015	8.5	21.0	0.51	0.51	0.51	0.51	0.51	0.51
2016	8.7	21.3	0.52	0.52	0.52	0.52	0.52	0.52
2017	8.9	21.6	0.53	0.53	0.53	0.53	0.53	0.53
2018	9.1	21.9	0.54	0.54	0.54	0.54	0.54	0.54
2019	9.3	22.2	0.55	0.55	0.55	0.55	0.55	0.55
2020	9.5	22.5	0.56	0.56	0.56	0.56	0.56	0.56
2021	9.7	22.8	0.57	0.57	0.57	0.57	0.57	0.57
2022	9.9	23.1	0.58	0.58	0.58	0.58	0.58	0.58
2023	10.1	23.4	0.59	0.59	0.59	0.59	0.59	0.59
2024	10.3	23.7	0.60	0.60	0.60	0.60	0.60	0.60
2025	10.5	24.0	0.61	0.61	0.61	0.61	0.61	0.61
2026	10.7	24.3	0.62	0.62	0.62	0.62	0.62	0.62
2027	10.9	24.6	0.63	0.63	0.63	0.63	0.63	0.63
2028	11.1	24.9	0.64	0.64	0.64	0.64	0.64	0.64
2029	11.3	25.2	0.65	0.65	0.65	0.65	0.65	0.65
2030	11.5	25.5	0.66	0.66	0.66	0.66	0.66	0.66
2031	11.7	25.8	0.67	0.67	0.67	0.67	0.67	0.67
2032	11.9	26.1	0.68	0.68	0.68	0.68	0.68	0.68
2033	12.1	26.4	0.69	0.69	0.69	0.69	0.69	0.69
2034	12.3	26.7	0.70	0.70	0.70	0.70	0.70	0.70
2035	12.5	27.0	0.71	0.71	0.71	0.71	0.71	0.71
2036	12.7	27.3	0.72	0.72	0.72	0.72	0.72	0.72
2037	12.9	27.6	0.73	0.73	0.73	0.73	0.73	0.73
2038	13.1	27.9	0.74	0.74	0.74	0.74	0.74	0.74
2039	13.3	28.2	0.75	0.75	0.75	0.75	0.75	0.75
2040	13.5	28.5	0.76	0.76	0.76	0.76	0.76	0.76
2041	13.7	28.8	0.77	0.77	0.77	0.77	0.77	0.77
2042	13.9	29.1	0.78	0.78	0.78	0.78	0.78	0.78
2043	14.1	29.4	0.79	0.79	0.79	0.79	0.79	0.79
2044	14.3	29.7	0.80	0.80	0.80	0.80	0.80	0.80
2045	14.5	30.0	0.81	0.81	0.81	0.81	0.81	0.81
2046	14.7	30.3	0.82	0.82	0.82	0.82	0.82	0.82
2047	14.9	30.6	0.83	0.83	0.83	0.83	0.83	0.83
2048	15.1	30.9	0.84	0.84	0.84	0.84	0.84	0.84
2049	15.3	31.2	0.85	0.85	0.85	0.85	0.85	0.85
2050	15.5	31.5	0.86	0.86	0.86	0.86	0.86	0.86
2051	15.7	31.8	0.87	0.87	0.87	0.87	0.87	0.87
2052	15.9	32.1	0.88	0.88	0.88	0.88	0.88	0.88
2053	16.1	32.4	0.89	0.89	0.89	0.89	0.89	0.89
2054	16.3	32.7	0.90	0.90	0.90	0.90	0.90	0.90
2055	16.5	33.0	0.91	0.91	0.91	0.91	0.91	0.91
2056	16.7	33.3	0.92	0.92	0.92	0.92	0.92	0.92
2057	16.9	33.6	0.93	0.93	0.93	0.93	0.93	0.93
2058	17.1	33.9	0.94	0.94	0.94	0.94	0.94	0.94
2059	17.3	34.2	0.95	0.95	0.95	0.95	0.95	0.95
2060	17.5	34.5	0.96	0.96	0.96	0.96	0.96	0.96
2061	17.7	34.8	0.97	0.97	0.97	0.97	0.97	0.97
2062	17.9	35.1	0.98	0.98	0.98	0.98	0.98	0.98
2063	18.1	35.4	0.99	0.99	0.99	0.99	0.99	0.99
2064	18.3	35.7	1.00	1.00	1.00	1.00	1.00	1.00
2065	18.5	36.0	1.01	1.01	1.01	1.01	1.01	1.01
2066	18.7	36.3	1.02	1.02	1.02	1.02	1.02	1.02
2067	18.9	36.6	1.03	1.03	1.03	1.03	1.03	1.03
2068	19.1	36.9	1.04	1.04	1.04	1.04	1.04	1.04
2069	19.3	37.2	1.05	1.05	1.05	1.05	1.05	1.05
2070	19.5	37.5	1.06	1.06	1.06	1.06	1.06	1.06
2071	19.7	37.8	1.07	1.07	1.07	1.07	1.07	1.07
2072	19.9	38.1	1.08	1.08	1.08	1.08	1.08	1.08
2073	20.1	38.4	1.09	1.09	1.09	1.09	1.09	1.09
2074	20.3	38.7	1.10	1.10	1.10	1.10	1.10	1.10
2075	20.5	39.0	1.11	1.11	1.11	1.11	1.11	1.11
2076	20.7	39.3	1.12	1.12	1.12	1.12	1.12	1.12
2077	20.9	39.6	1.13	1.13	1.13	1.13	1.13	1.13
2078	21.1	39.9	1.14	1.14	1.14	1.14	1.14	1.14
2079	21.3	40.2	1.15	1.15	1.15	1.15	1.15	1.15
2080	21.5	40.5	1.16	1.16	1.16	1.16	1.16	1.16
2081	21.7	40.8	1.17	1.17	1.17	1.17	1.17	1.17
2082	21.9	41.1	1.18	1.18	1.18	1.18	1.18	1.18
2083	22.1	41.4	1.19	1.19	1.19	1.19	1.19	1.19
2084	22.3	41.7	1.20	1.20	1.20	1.20	1.20	1.20
2085	22.5	42.0	1.21	1.21	1.21	1.21	1.21	1.21
2086	22.7	42.3	1.22	1.22	1.22	1.22	1.22	1.22
2087	22.9	42.6	1.23	1.23	1.23	1.23	1.23	1.23
2088	23.1	42.9	1.24	1.24	1.24	1.24	1.24	1.24
2089	23.3	43.2	1.25	1.25	1.25	1.25	1.25	1.25
2090	23.5	43.5	1.26	1.26	1.26	1.26	1.26	1.26
2091	23.7	43.8	1.27	1.27	1.27	1.27	1.27	1.27
2092	23.9	44.1	1.28	1.28	1.28	1.28	1.28	1.28
2093	24.1	44.4	1.29	1.29	1.29	1.29	1.29	1.29
2094	24.3	44.7	1.30	1.30	1.30	1.30	1.30	1.30
2095	24.5	45.0	1.31	1.31	1.31	1.31	1.31	1.31
2096	24.7	45.3	1.32	1.32	1.32	1.32	1.32	1.32
2097	24.9	45.6	1.33	1.33	1.33	1.33	1.33	1.33
2098	25.1	45.9	1.34	1.34	1.34	1.34	1.34	1.34
2099	25.3	46.2	1.35	1.35	1.35	1.35	1.35	1.35
2000	25.5	46.5	1.36	1.36	1.36	1.36	1.36	1.36
2001	25.7	46.8	1.37	1.37	1.37	1.37	1.37	1.37
2002	25.9	47.1	1.38	1.38	1.38	1.38	1.38	1.38
2003	26.1	47.4	1.39	1.39	1.39	1.39	1.39	1.39
2004	26.3	47.7	1.40	1.40	1.40	1.40	1.40	1.40
2005	26.5	48.0	1.41	1.41	1.41	1.41	1.41	1.41
2006	26.7	48.3	1.42	1.42	1.42	1.42	1.42	1.42
2007	26.9	48.6	1.43	1.43	1.43	1.43	1.43	1.43
2008	27.1	48.9	1.44	1.44	1.44	1.44	1.44	1.44
2009	27.3	49.2	1.45	1.45	1.45	1.45	1.45	1.45
2010	27.5	49.5	1.46	1.46	1.46	1.46	1.46	1.46
2011	27.7	49.8	1.47	1.47	1.47	1.47	1.47	1.47
2012	27.9	50.1	1.48	1.48	1.48	1.48	1.48	1.48
2013	28.1	50.4	1.49	1.49	1.49	1.49	1.49	1.49
2014	28.3	50.7	1.50	1.50	1.50	1.50	1.50	1.50
2015	28.5	51.0	1.51	1.51	1.51	1.51	1.51	1.51
2016	28.7	51.3	1.52	1.52	1.52	1.52	1.52	1.52
2017	28.9	51.6	1.53	1.53	1.53	1.53	1.53	1.53
2018	29.1	51.9	1.54</					

What "Facts for Filing" do you want? Write: The Editors, Aviation Week, 330 West 42 St., New York 36, N.Y.

SIX BIG REASONS for using Pesco unloading hydraulic gear pumps:



1. Fewer parts
 2. Easier to recondition
 3. Longer service between overhaul periods
 4. Lighter weight
 5. Lower initial cost
 6. Lower maintenance costs



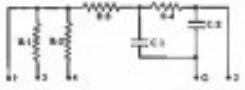
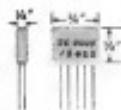
This chart shows performance characteristics of Power Unloading Pump. Write to distributor for detailed technical data.



The **Perry Hydraulics Hydrolic Gear Pump** is the most compact and dependable pump built for applications where a variable volume of hydraulic fluid is required. This Pump pump automatically adjusts flow rate of fluid to increasing and decreasing demands of the hydraulic system. It incorporates a main and a pilot pump as well as unloading and relief valves in one unit. And it's "pressure tested"—Perry's exclusive, patented design principle that assures extremely high operating efficiencies over a long, trouble-free pump life because it automatically compensates for wear. For the complete story write today.

BORG-WARNER CORPORATION
24700 NORTH MILLES ROAD BEDFORD, OHIO

AVIONICS



MINIATURE PACKAGE of an printed and converted resistor and capacitor hybrids.

New Gains in Printed Circuitry

Tiny pack units designed to meet closer production tolerances also have improved temperature ranges.

By Philip Klass

Printed circuit tolerances, while not new in themselves, are making a new bid for use as weight and space savings components in today's electronics equipment. The bid is made by new printed circuit pads containing up to six resistors and capacitors pre-converted into a desired circuit.

According to data furnished by the manufacturer, the Standard Ceramic and Manufacturing Co., Lynbrook, N.Y., the new printed circuit pads appear to come close to meeting the tighter tolerance requirements and manufacturing tolerances required for avionics equipment that did not earlier printed circuits.

Energy Conservation. Designers of resistors and capacitors are presented in the desired circuit configuration, with interconnections already made, many soldered connections are eliminated. The result: faster assembly and savings with less chance for wrong wires and bad connections. That in turn reduces fewer rejects and less time spent on trouble shooting and research.

Equally important is the weight and space savings feature of the new printed resistors and capacitors. In addition to direct savings over the use of individual resistors and capacitors, the new and eliminating many of the connecting wires, economy is realized.

The Stepoff® printed circuit pads are currently available in a variety of integrations, including coupling, and other standard network circuits. Special circuits can be made to order, the manufacturer says.

Temperature Characteristics. The new printed circuit pads are suitable for operation in two different temperature ranges. One, called the compensated, operates from +50°C to +140°C. The other, for military use, is designed

for temperatures between -54°C and +140°C. The wider military limits require lowering the top operating temperature slightly.

Only negligible changes in capacitance occur within the specified temperature range because of the natural temperature compensation of the dielectric base plastic. Stepoff says. Reference values are said to hold constant within ±2% of the specified temperature range.

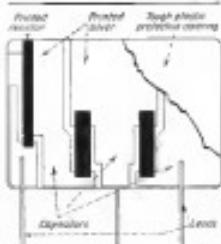
Printed circuit tolerances, while not new in themselves, are making a new bid for use as weight and space savings components in today's electronics equipment. The bid is made by new printed circuit pads containing up to six resistors and capacitors pre-converted into a desired circuit.

Only negligible changes in capacitance occur within the specified temperature range because of the natural temperature compensation of the dielectric base plastic. Stepoff says. Reference values are said to hold constant within ±2% of the specified temperature range.

Most of the engineers queried are looking for components designed for temperatures of 100°C or higher. Stepoff says that it is working to develop a dielectric material suitable for higher temperatures.

Another manufacturer and not the holder had an idea which suggested abandoning certain printed circuits in a new development because of unreliability. Another engineer questioned whether it would be economical to prepare special printed circuit templates for military equipment which is built at relatively high temperatures.

Microcircuits. Telephone-bound inquiries to Standard, the units are available with resistance values of 1 ohm to 6 megohms, 5 watt to 2 watts, with a tolerance of ±5%. Capacitor values are available from 2 micromicrofarads to 0.04 microfarads with a tolerance of



CONSTRUCTION of new printed network pack.

New Potting Materials

New plastic casting materials which cure at room temperature in less than 15 min have been developed by E. G. Foresman Co. for potting electronic assemblies and transistors.

These different formulas provide either air-shrinking, slight deflection, or slight expansion of the plastic after curing, depending upon molding requirements.

A low viscosity formula applied under vacuum can provide complete penetration and sealing of transistors.

E. G. Foresman Co., Inc., 151 Thompson Ave., Brooklyn 6, N.Y.



Clifford Feather Weights Cool the Oil in

WORLD'S LARGEST COOLER, the Convair B-36, has a 10,000 ft/min range and a cooling of over 40,000 ft-lb.

It uses a Clifford oil cooler in part of the heat generated in the aircraft speed drive which turns the engine to the 400 cycle alternator. The oil cooler is inserted in the power train of the oil unit under the engine undercarriage (left) and right, and permits the use of a smaller size and lower weight drive.

CONVAIR B-36 D BOMBERS

Conventional or jet powered, civilian airliner or world's largest bomber... all types of modern aircraft depend on Clifford Feather Weight All-Aluminum Oil Coolers... the only all-aluminum type of oil cooler. Their superior weight-to-strength ratio is achieved through Clifford's patented forming method and pre-toring in Clifford's wind tunnel laboratory... the largest test room in the international heat exchanger industry. For further details, write Clifford Manufacturing Company, 1508 Grove Street, Waltham 24, Mass., Division of Standard-Thomas Corporation, Sales office in New York 17, Detroit, Chicago 1, Los Angeles.

CLIFFORD

ALL-ALUMINUM OIL COOLERS
FOR AIRCRAFT ENGINES

HYDRAULICALLY-FORMED BELLOWS
AND BELLOWS ASSEMBLIES



in even are reduced as a result of metal contraction which uses up losses or elongates lengths. Bourdon tube is made of two thermocouple conductors twisted to reduce its sensitivity to temperature changes, the manufacturer says. In addition, the transducer contains thermostatically controlled heating loops which heat at about 1°C to prevent water condensation and possible icing.

Two Models The differential pressure transducer, TR102, spans through a differential pressure range of 0 to 680 milli-Hg, and a maximum total pressure range of 97 to 1,444 milli-Hg.

The absolute pressure transducer, TR105, operates between 0 and 760 milli-Hg, with each milli-Hg less than 24 millibars in.

When connected to a 1-megohm load, the units have a maximum output signal voltage of about 3 volts for the rated 36-volt excitation. The scale factor is approximately 0.0005 volts/volt excitation/milli-Hg. The signal voltage is proportional to input pressure within $\pm 2\%$ full scale.

Specifications say the new transducers meet military specification ANE-19.

Additional information may be obtained from Servomechanisms, Inc., Westbury, Long Island, N.Y.



Small Plug-in Amplifier

A new miniature plug-in amplifier with a maximum voltage gain of 9,800 and a frequency response, flat within ± 1 db, from 2 to 1,800 cps, has been developed by Engineering Research Associates, Inc.

The new amplifier is potted in a case measuring 31 in. by 21 in. by 1 in. and weighs only 3.5 oz., reducing the need for enclosures. The unit plugs into a standard test base.

Two types of applications for the new single stage amplifier include integrating circuits in which integration is achieved by a stabilizing negative feedback circuit. ERA says that the unit will accept an extraordinary amount of negative feedback without instability.

Significant characteristics of the new unit, input impedance, 2 megohms, output range, 10 microvolts to 2 millivolts rms, maximum output, 20 millivols rms, power supply requirements, 600 ma, 5.5 v filament supply, 0.5 ma, 250 v plate supply, output impedance, 3,000 ohms.

Engineering Research Associates, Inc., Dept. A, 1902 West Moreland Ave., St. Paul 4, Minn.

Australia to Make Radar Equipment

(McGraw-Hill World News)

Melbourne—Australia is taking major steps to start an industry to manufacture aircraft and other military aircraft to sell in the free world. The step follows closely on the heels of military extensions of dissatisfaction over the lack of new and replacement electronics equipment to meet growing defense needs.

Electronic Industries Ltd. of Melbourne will be the first Australian radar producer. It will have set equipment for Navy ships and establishments. A survey is now being made to choose suitable factories that will manufacture radar equipment to be required for military purposes.

AVIATION WEEK April 18, 1958



Why you should specify G-E SILICONE RUBBER PARTS for extra-high-temperature seals

General Electric's complete fabricating service also offers you:



• G-E silicone parts—with a unique combination of properties, including high dielectric strength, dimensional stability and resistance to 500°C.



• G-E sealing caps and sleeves—to protect wiring and metal parts from ice, moisture, dirt, paint and chemicals. Up to 300°C. in temperature and pressure down to 100°F.

When designs call for sealing rings and gaskets subject to continual extremes of temperature, specify General Electric silicone rubber parts! They're ideal for high heat sealing applications because they are able to withstand long exposure to 500°F without deteriorating or becoming tacky. G-E silicone rubber parts have low-compression set even under high heat, possess excellent dielectric and insulating properties.

In engines, for example, there may be use for G-E silicone rubber parts, oil seals, fire wall seals and ignition cable insulation. Why not investigate the remarkable properties of General Electric silicone rubber parts for your designs?

For more information, write to General Electric Company, Section 1136, Chemical Division, Pittsfield, Mass.

GENERAL ELECTRIC

1957

and unusual cost savings such as re-use and shipping.

Australia's expanding electronics needs had recently prompted talk of importing electronic equipment, possibly from the U.S. if reasonable delivery dates could be obtained.

Heat Is Big Problem In Avionics Equipment

Columbus, O.—Getting rid of heat generated in avionics equipment is a major problem today, judging from comments of the 300 engineers and physicists from more than 30 different airlines and avionics manufacturers and government agencies who attended the first conference held exclusively for the purpose of discussing the cooling problem.

Sponsored by the Ohio State University Research Foundation and the USAF, the meeting was held in Columbus last month.

Conference speakers urged that:

- Aviation equipment location in the airplane be carefully chosen to ease cooling problems.
- Military environmental specs be revised.
- More high-altitude test facilities be set up.
- Better dissemination of data on avionics cooling by word.

Because of the Learn interest shown in the recent conference and in the avionics cooling problem, the AF is considering arrangements for a class meeting to be held later in the year in Dayton.

Blowers Cause No Radio Interference

A new series of 6-in. centrifugal blowers for cooling avionics equipment, designed to operate from a variable frequency (130 to 1,000 cps) source, has been developed by Avionics Electronics Motors, Inc.

The motors are used to drive squirrel-cage regulators and reduced power consumption throughout the wide frequency range because of their increased static air gap and reduced rotor dia- meter.

Since the new motors are no less expensive in construction or design, they eliminate radio and radar interference, a shortcoming of cast ac-motors, the manufacturer states. The new series is designed to operate in the ambient temperature ranging from -65°C to 60°C.

Avionics Electric Motors, Inc., 4031 E. Anderson Technology Road, Los Angeles 22, Calif.



HERE'S HOW YOU SAVE TIME AND MONEY

You buy from one source, order fast, so, only one liaison to deal with—*you save time.*

From warehouse, from coast to coast, with large inventories, ready, prompt delivery and lowest freight rates!

Only one purchase order covers accounting and it's easier to expedite.

You get better service, more and for price or delivery information.

Rapid delivery, backed by 20 years experience in the aviation industry is assured when you buy from Air Associates. Call today!

Air Associates

SERVING THE NATION IN AVIATION



CHICAGO • DALLAS • TETERBORO • GLENDALE • MIAMI
Milwaukee, Texas, New Jersey, California, Florida

AVIATION WEEK April 18, 1958

EQUIPMENT



MULTICAMERA LAYOUT, such as the one implemented on LaGuardia Airport, could photograph and record a long takeoff or landing.

New Camera Pinpoints Landing, Takeoff

Accuracy, ease of operation claimed for Fairchild unit; camera does not move while optical sight tracks plane.

By George L. Christian

A flight analysis camera developed by American Airlines, which has used it in "surprisingly accurate" has been developed by Bausch & Lomb & Associates Inc., New York.

Purpose is to record takeoff, mid-flight and landing characteristics of aircraft.

Fairchild currently has a Fairchild analyzer camera on test (not at present) and Pan American World Airways has expressed interest in the instrument, according to its manufacturer.

AA Analytic America worked with an early version of the camera and found three assets:

- Versatility. It is easily transportable. The whole package consists of one or more cameras (depending on length of flight) capable of being self-contained, battery operated and simple, lightweight manus-

dature surfaces and measurement, all of which may be packed up and loaded easily from one air field to another. Ability to move the camera to the aircraft without of having to bring the plane to the instrument is a big advantage over large ground-type equipment whose installation is fixed.

• Quick setup. The Fairchild system is not only highly portable, but is rapidly and easily set up at any unprepared airport, using considerable time and effort.

• Ease of interpretation. Present analyzer plane's performance has only to take a photographic print in his desk and go in work. No special projection rooms or elaborate interpretive paraphernalia are required. Spot accuracies of 1/1,000 in. on the photographic plate (original) to about 4 ft. on the run way are obtained. True parallax of latest model is 1/1,000 in.

* Independence. Fairchild's accuracy is not dependent by wind direction or position of the aircraft.

As a result of recommendations made by AA engineers, K. J. Farhadian, Fairchild general manager and co-developer of the flight analysis camera, was able to negotiate several improvements on the unit. These included a dual instead of single lens plane shutter and more accurate timing.

Sherman Farhadian directed this extra development. He also favored it not be his own project.

► What You Get—Here is what the new analyzer camera will give you, according to Fairchild:

- Altitude and angle of attack of an aircraft is recorded for a complete concave.

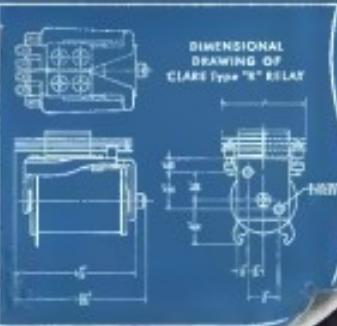
- Glide and landing approach paths at different throttle and flap settings and various flight attitudes are recorded easily.

- Ground speed, length of takeoff runs or landing rolls, distance to clear obstacles under various conditions of grav-

A NEW CLARE RELAY...

the Type "R" combines extremely
small size with unusual sensitivity and long life

CLARE Type "R" RELAY



SPECIFICATIONS

SIZE

Length 1-1/2" Height 1-1/2" Width 1"

WEIGHT

Approximately 2 ounces

COR

Single or double-wound

OPERATING VOLTAGE

Up to 250 volts d-c

ARMATURE

Single or double arm.

CONTACT ASSEMBLY

Form A to C Monroe or 10 springs in each plunger

MOUNTING

Two #10-32 tapped holes or slot of baseplate

* The new CLARE Type "R" dc Relay combines many features of the famous CLARE Type "K" Relay, which was the first to combine the advantages of a bell-shaped type relay with the small size, light weight and reliability of vibration required to meet the rigid demands of aircraft relays.

In appearance, the Type "R" resembles the Type "K", but, through largely noticeable structural differences, CLARE has given the new Type "R" even greater sensitivity and operating range. Both relays use the same contact design, but the Type "R" coil is longer and of larger diameter, to provide greater winding span. Life expectancy of this new relay has been not only increased but multiplied.

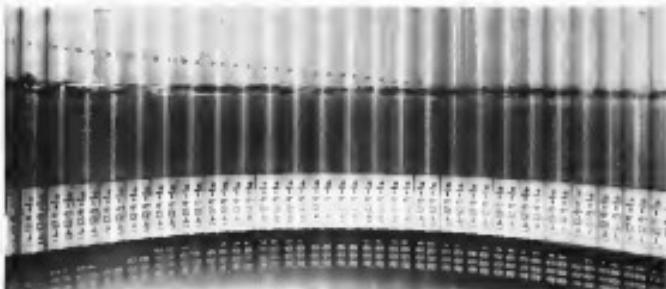
The CLARE Type "R" Relay retains an improved form of the well-known resistor which, during testing engineers have come to recognize as one of the major factors for the superior performance of CLARE Type "K" Relays over other relays of comparable size and somewhat similar appearance.

The Type "R" is available in either an open or hermetically sealed relay. Close sales figures are located in separate states to give you firsthand information on this new relay and to compare it on an apples-to-apples relay problem. Get them or write to E. P. Clark & Co., 6713 West Storyville Avenue, Chicago 36, Illinois. In Canada: Canadian Base Materials Ltd., Toronto 25. Cable Address: CLAREL.

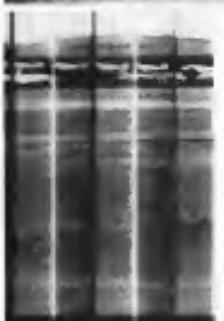
Write for CLARE Bulletin No. 113

CLARE RELAYS

First in the Industrial Field



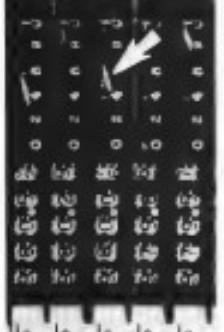
COMPLETE TAKEOFF is registered by Fairchild marker cameras, giving graphic plot of plane position against time. White strip shows flight number and date.



weight, engine power, flap settings, etc., is given, allowing acceleration and propulsive thrust to be determined.
• Actual developed lift coefficient can be calculated.
• Variations in attitude or altitude during climb can be established by the analysis. It gives an accurate speed-spiral record permitting study of speed variations. Effects of wind shift can be determined by averaging up and down wind run results.
• Reversible pitch propeller decisions can be determined, as well as effect on engine thrust.

Strengthening of flight analysis and auto observer flight instrumentation can be accomplished by fitting a Cinescan light which shows up on the plate, indicating true attitude on the axis observed by the system. A very good finding a line up to the center line. One more advantage:
• Analysis Adiabatico—Fairchild strengthens these features of the instrument:
• No slugs or cutouts. Fairchild's own no rotation cutouts, does not want to follow movement of aircraft. Therefore the photographic plate (in 1/100 minutes parallel to the plane of flight). Result is that an use of mouse connection due to transposition are necessary, and connecting mechanisms are used.
• Same size images. Cinefilm height of plane remaining stationary and parallel to camera so that plane's images on the film are all of the same size. No magnification corrections are necessary to correct images of different sizes, better reading engineering work.
• Long life lights required. Length of aircraft indicator length can be recorded.

THOUSANDS of a second may be lost from position of sprung while break is found, have between digits 5 and 6.



3½ BILLION GROUND PROVEN MILES



Westinghouse
Decelostat Controller

tailored to individual airplane specifications—thus, assuring best performance pattern and safest stop.

AIRCRAFT SECTION
WESTINGHOUSE
AIR BRAKE COMPANY
WILMINGTON, PENNA.
INDUSTRIAL PRODUCTS DIVISION



3,500,000,000 Decelostat Miles of railroad operation have tested and proved the value of the Westinghouse AP Decelostat. For many years, these Decelostats have contributed to improved efficiency in railroad operation through the elimination of wheel skid when brake pressure is applied.

These same advantages are now applied successfully to aircraft brakes. When the pilot applies the selected brake pressure, the AP Decelostat automatically eases and restores this pressure as dictated by runway conditions.

With the Decelostat, skidding is banished. Airplane tire life is increased many fold . . . and, the dangers of ground looping and landing over-run are diminished. Westinghouse welcomes your inquiry. Address

...it takes real
Performance



LATEST development of Fairchild cameras has optional slide or key sight modes, can run remote shift. Black box adds camera at passing load for remote tracking.

single-lever combination camera arm and film (photostatic slides or a 16 mm) gear rack, seats a small person to drive a single-lens cam through a gear train. Gear weighs over 100 pounds, runs at each 100 deg. of camera rotation. Microswitches engage precision microscrews which rotate shutter through reinforcement lever arm.

So, as operator follows switch on in takeoff and the site slides over plate, the solenoids snap shutters as rapidly as needed to take up to 15 strips/plate or one 8x10 plate.

Introducing, the second shutter is synchronously driven from the first held in front of the camera on an extension arm. The chart card shows date and number of flight.

►Fast Timer—The timer is a five-digit timer counter made by Vendo-Rite. The third digit from the bottom ticks every second, the fourth tenth and the fifth hundredths of a second.

Here is where Fairchild bri's mag. He wanted greater time accuracy, down to 1/1,000 of a second. But, if he sped the counter up to make the fifth counter record thousandths of a second, it would pass the shutter so fast that only a blur was registered on the plate.

Fairchild engineers attached a small sheet to the fifth counter. Ten before white heat on the drama strip behind a narrow slit along one edge of which appear the digits 2, 4, 6, 8, 0. Each helix has on the drama strip over 1/100 sec. on its end, so the helix bows to top of the slot taking 1/100 sec. By means of the scale adjacent to the slot it is possible to split that time into ten-thousandths of a sec.

►Special Feature—Tolerances of the Fairchild cameras are held so tight that

...to build a reputation

And it has taken years of continuously maintained quality to make Amphenol the keyword of the electronics industry. The long list of manufacturers specifying Amphenol is the production of equipment for military aircraft coincides with the list of those who are best known in the field of aircraft development.

The strain of super-sonic and near super-sonic speeds, extreme variations in temperatures and the sudden stress of combat maneuvers mean that anything less than top quality will result in failure. Amphenol's engineers are not even satisfied with meeting the present rigid Army-Navy Specifications. Production samples are continually being "tortured" in Amphenol's extensive testing laboratories in a program of improvement on the present high standards.

Specifying Amphenol cables and connectors is your positive assurance that the electronic components in your equipment will not fail.

Your copy of *Amphenol Catalog E-2*, which contains the complete Amphenol line of connectors, will be sent on request.

AMPHENOL

AMERICAN PHENOLIC CORPORATION
1520 SOUTH 22ND AVENUE • CLEVELAND 14, OHIO



"MECHANIZED ANGELS!"

All military service records for speedy evacuation of wounded United Nations troops in Korea have been破壞 by the Army's Bell H-13D helicopter. Important components which are made of CORTICO Aircraft Tubing:

Like the majority of leading U. S. plane manufacturers, Bell Aircraft Corporation, Buffalo, N. Y., specifies CORTICO Aircraft Tubing because of its remarkable strength without weight characteristics and operational dependability and economy.

CORTICO Aircraft Tubing meets all Army, Navy, and A.M.S. specifications and is widely used for landing gear, fuel lines and a wide range of other applications. Send for free Handbook & Catalogue with listing of all products made of CORTICO Aircraft Tubing. Airframe Stock List (revised bi-monthly) also available. Address your nearest CORTICO Sales Office or write direct to General Office, Shively, Ohio.



THE OHIO STAINLESS TUBE COMPANY
Manufacturers and Distributors of Stainless and Weather-Resistant Steel Tubing
Plant and Offices: Shively, Ohio



OSTUCO DIVISION, Indianapolis, F. O. Box 2511 • Chicago, Calif. Office: 200 W. Madison St. • Cleveland, 1200 Euclid Blvd. • Detroit, 2111 Cass Ave. • Denver, 1200 15th St. • Toledo, 1700 W. State Street • Louisville, Ky.: 1000 W. Main St. • Atlanta, 407 Peachtree St. • Miami Beach, 70 South Miami Ave. • Philadelphia, 1414 Market St. • Boston, 400 Atlantic Ave. • San Francisco, 1000 Market St. • Seattle, 1200 First Ave. • Tulsa, 2500 Main St. • Wichita, 402 S. Third St. • Correspondence: Indianapolis 8 Power Corp., Inc.

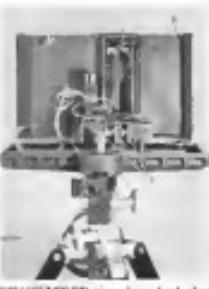


They Write Their Own Timetables

- Corporate use of single-engine planes is spreading at a rate which gives emphatic proof of their utility. An estimated 7,500 aircraft of this type comprised this "business fleet" in 1951, an increase of some 25 per cent since 1946.
- Such craft not only bring points off main airline routes within range of fast air travel, but lessen businessmen's dependence on hard-and-fast timetables. More and more of them are writing their own, and saving countless hours of time.
- As builder of the engines powering the greater number of these planes, Continental Motors is gratified, naturally, both at the proof of utility which such aircraft reflect, and at user's clear preference for planes with Continental power. Needless to say, it stands committed to the policies which have fostered this preference.
- Continental will continue its emphasis on aggressive engineering, its adherence to highest standards of material and workmanship, and for free less important, on the maintenance of parts and service whenever businesses—or anyone else—may fly.



Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN



DISMASSEMBLED view shows how plane starts (1) which comes with marking disk (2). Schematic set below (3).

the gear rack can be lowered at one end while the other holds to engage with the other end, which might cause bending of the gear.

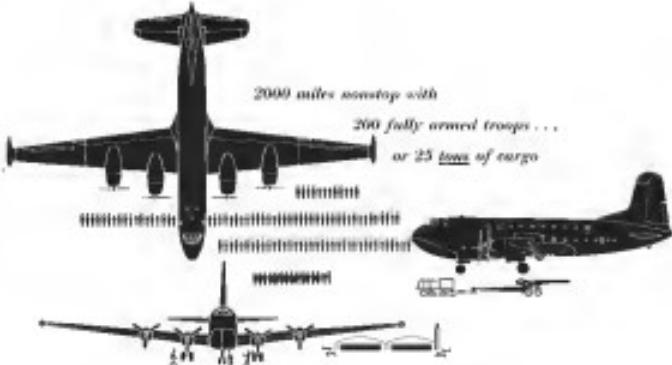
A problem still exists. Fairchild admits, in controlling the starting during these periods, especially if change of speed is rapid. Difficulty lies in controlling. Never until recently has exactly, rotation of eight hub-shafts to get true driving without controlling one and matching velocities to give identical operating characteristics.

To ensure reliable operation, Fairchild had them specially designed and tested by Dr. Robert Roten, a consulting engineer. Each part's characteristics are checked on an oscilloscope to assure electrical operation.

►How It Started—Applied at the instant the task of calculating required to measure them of a propeller and its effect on the performance of a small plane that did not prove according to prediction. Fairchild, in collaboration with Sherman M. Fairchild, invented a more, cheaper and faster method of obtaining the desired data. This was during World War II.

First flight analyzer was a modified Bolex movie camera rigged for single frame operation. It was driven through a motor selected by a Fairchild micro-voltmeter, timing exposure evenly at 1 sec. Picture was taken through a glass screen.

Next step was a still camera using the multiple strip principle, suggested by Dr. John H. Bott, director of the New York University Jet and Plane Research Laboratory. But the camera had a standard bellows that flexed too much to obtain sharpness. So Fairchild worked out the single focal plane which traveled with the strip. This solved the quick tripping prob-



—the Douglas C-124 Globemaster!

More versatile troop and cargo carrier in the air today, the Douglas Globemaster gives our Armed Forces new mobility in either attack or defense.

►To take off at a gross weight of more than 81 tons, the Globemaster II—in flight more powerful planned capacity by nearly 15 times. This aerial

giant can lift 80% of all types of military vehicles fully assembled—trucks, bulldozers, large cranes and landed tanks.

A single C-124 can transport 200 completely equipped troops across the Atlantic—and save precious fuel resources. When used as an airborne freighter, it can accommodate 227 litter pa-

tients plus all of the necessary doctors, nurses and attendants.

Performance of the C-124 Globemaster is another example of Douglas leadership in aviation. Building planes that can be mass-produced to fly faster and farther with a longer payload is the fine rule of Douglas design.



Depend on DOUGLAS



First in Aviation

WRITE FOR

Hassall
decimal-equivalent
wall chart



In such popular demand, we've given away 30,000—yet we're still behind. The new chart is far easier to read! In three colors so automatically signal decimal equivalents of fractions. The special pointers which frame the chart are a constant reminder of a good source for cold-headed parts.

JOHN HASSALL, INC.
142 CLAY STREET • BROOKLYN 22, N. Y.



Sky's the limit... OR IS IT?

With man's memory of the air age reaching its almost infinite limit in the absence of science—with broad horizons, we of Schottig & Company engineering staff with visitors and understanding... our products reflect quality and design superiority. You can probably help yourself with designs or protection.



Schottig & Company
INCORPORATED
WASHINGTON 25, D. C.

EQUIPMENT MANUFACTURING INDUSTRIES



FIRST VERSION of the analytical camera had a bellows in the lens shutter, replaced later by focal plane shutter.

lens, but swifter headache developed. If the shutter speed were fast enough to stop the first-opening digital cameras, the sharpness of the plane's movement would hardly be understood. If shutter speed were great, to proper exposure of the plane, duration was blurred.

Orionics won the two-speed shutter. Plane picture is taken at a questionable 1/400 sec., fast enough to "freeze" the plane, slow enough to give photo in film single exposure. Time and date card are dissociated separately, and a 1/1,600 sec. shutter stage in record fast enough to give sharp pictures of an information which is superimposed on the bottom of the same picture.

► What Neff-Panhandle felt that the analytical camera has reached a stage of development where it can do a delicate job for aircraft manufacturers, airlines and the military with great accuracy, and at a reasonable cost.

He recommended to Orionics' high opinion of the analysis and by Grumman's interest in the camera for checking jet aircraft performance.

Already, Fairchild engineers have pioneered a shutter with the same high speed characteristics as the existing camera, but which will give accurate timing in spite of variation in battery voltage as electrical outputs.

Also, in taking pictures of extremely high-speed aircraft where a battery of cameras are used, provision will be made to track the aircraft a short distance before aerial photograping is started. This lead-in, lead-out feature will improve accuracy of overlapping film frames.

Fairchild officials are sure their instrument can perform similar services for the government guided missile program—at least in the ridiculous regions.



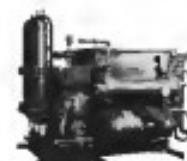
Universal Airflow Wind Tunnel



Universal Transonic Wind Tunnel



Universal Pressure Gradient Series



Rock Crusher Hydraulic Power Pack



Jet Engine Test Pump Unit Model



Diamond Impact Test Stand



Universal Hydraulics Power Assembly Test Stand



Portable Hydraulic Test Stand



Diesel Generator for Aircraft Accessories

"But who tests the test equipment?"

Greer engineers test airplane flight over, under conditions for every severe flight control operation—below & over land—the plant. For we know that testing equipment must have the complete confidence of those who use it. Greer equipment deserves that confidence, and has it—because it has earned it.

Not more produced by the mile thousands, each Greer test stand is painstakingly engineered, and is carefully tested at each stage of production for absolute accuracy. The men who design these and the men who build them have many years of specialized experience in this narrow field. It is experience that is difficult to find—perhaps impossible to match elsewhere.

In addition to standard models, many special machines have been developed to meet specific requirements. A staff of creative engineers is always available for a discussion of out-of-the-ordinary problems. Write or call today, no obligation.



GREER
TEST EQUIPMENT

FOR AVIATION AND INDUSTRY

GREER HYDRAULICS INC. • 454 EIGHTEENTH STREET • BROOKLYN 15, NEW YORK

Tel Office: 6-1444 Wabash • 200 Commonwealth Ave., Boston, Mass. • 2-2612 East Grant Boulevard, Brooklyn 15, New York
Representative: Technical Engineering Service, 300 George St., Newark, N. J. • Room 21, West 72nd Street, New York 23, New York

25 YEARS OF LEADERSHIP IN FASTENINGS IN STAINLESS STEEL

To YOU, Anti-Corrosive's 25th Anniversary is an assurance that the above, larger and best known firm dealing exclusively in stainless steel fastenings is here to stay to serve your needs in the field.

Still Plenty of Fasteners IN STOCK
For quick delivery of what you need, factors long, short or long, first, second, or third class, prices and alternatives are on hand!

FREE - A-N Fastening Selector I
Send for our free selector. Price \$2.00. Includes standards A-N, pertinent to stainless fastenings, sizes, sizes, sizes, data, catalog available.



True Results

The fine and work fasteners is now caused, not the fastener.

*Metal binder, for field bonding of various sizes of tubing (MIL-T-845), can be changed in 1 sec., held in a bench or mounted on a tripod. It is packed in a metal kit, comes with seven easy locking wheels and follows him. The set is designed to prevent deformities of tubing, providing even, rounded beads with cross sections and will withstand any applicable load.

*A setting tool and new forming and bending tool have been developed. To make pressure form Imperial points out, it is necessary that the ends of the tubing be cut and formed with precision notches. The company states, the new setting tool holds the required right-angle cuts with a standard tool, and the bending tool uses the same tooling as the shaping tool, but accommodates four mechanical controls for the set.

The new tools also can be used with sheeting, ribbing, rivets and other metals.

The Imperial Bolt Mfg. Co., 1290 W. Harrison St., Chicago 7, Ill.

Instrument Stripping

A new automatic stripping assembly designed for use on an air navigation instrument is being produced by the Electro-Tec Corp.

The assembly, incorporating 32 different wire insulation, color-coded length is used to remove insulation from high dimensional tolerances. Despite small size, the assembly easily meets very high potential strength and insulation requirements, Electro-Tec states.

The strip is produced by an exclusive method of machining the plastic block to remove the silver tape which are interwoven into place. Its method, according to the firm, eliminates accumulated stress damage to brittle assemblies. Rings are held close, yet securely fastened to prevent tension and minimize friction.

Overall length of the stripping assembly is 12.11 in. Individual strips measure in width, 0.020 in.; in height, width, 0.010 in.; and in ring diameter, 0.145 in.

Electro-Tec Corp., South Hackensack, N.J.

Famous and New Items

for
precision
castings
see
PENNSYLVANIA
first!

Working with your own design engineers, our specialists can help you with critical wrought castings, non-ferrous alloys, and alloys for severe service conditions. Our techniques and plant are ultra-modern and are geared to high-speed production at low cost. How can we help you? Just tell us your problems—we do the rest.

Famous and New Items

PENNSYLVANIA
PRECISION CASTING CO., INC., KIRKSTON PA



Float Nut Development

A new "Kajlock" floating anchor set follows in light on weight that on this report it not only is simply compact but with added strength making anchor sets. Since the float anchor family part in with has been developed by former MIL-C-6.

In fact, says Kajmor, it is fully competitive with fixed anchor sets in size, weight and strength. Many data show it is lighter than its corresponding fixed anchor set," the company claims. And the grip section when comparing it with comparable floating sets, according to the firm. In most popular sizes, it can weigh with it as much.

Previously, the advantage of the floating anchor (it is said) was in the fact which permits wider installation and facilitates assembly, obtained at the expense of increased weight and loss of interchangeability. With its new floating set, those drawbacks have been eliminated, says Kajmor.

To its plus side, the Kajlock floating set is believed interchangeable with standard fixed anchor sets of comparable sizes. Once the Kajlock has been applied, all spring load reactivation for use at temperatures up to 500°F, the part is built to meet strength and other requirements of Spec AN/N3k and AN/N3e.

Kajmor Mfg. Co., Inc., Kajlock division, 838 E. 16 St., Los Angeles.

Metal Bond Agent

A new line of resin adhesives for joining aluminum alloy and aircraft carbon structures has been developed by the Gila Co.

Gila engineers say the new adhesives are as strong as the sheet metal itself, yet can be applied in strong or fragile areas than provided by spotwelding or riveting.

Adhesives being used are based on the company's Araldite resins, all thermosetting compounds which cure without evolution of water or volatile matter at room or elevated temperatures. The adhesives are said to have high resistance to acids and solvents.

They are credited with curing a number of difficulties encountered in bonding metallic to non-metallic materials and unlike metals to each other.

Gila Co., Inc., Kankakee, Ill.



VIGILANT SURVEILLANCE

A paid-up insurance for conditioned freedom is a strong cause.

Throughout the entire aircraft industry, "Vigilant

Surveillance" is the keynote

... VOI-SHAN is proud to manufacture aircraft belt
in accordance with this tradition

VOI-SHAN

MANUFACTURING COMPANY, INC.

8443 Highland St., Culver City, Calif. • Texas 8-3321



FINANCIAL

Profit Margins on Sales

	NET BEFORE TAXES, %		NET AFTER TAXES, %	
	1951	1950	1951	1950
BELL	7.85	9.25	2.45	4.15
CORVIAIR	3.5	4.1	2.9	4.1
CURTIS-WRIGHT	8.5	10.0	3.9	3.4
DODGE	1.5	1.2	3.1	3.4
FARHOLD	8.2	7.8	2.9	6.1
GRUMMAN	10.2	12.5	3.4	6.1
LOCKHEED	8.2	8.7	2.6	4.2
MCDONNELL	10.7	12.6	4.9	7.1
NORTH AMERICAN	7.0	9.5	3.5	5.6
REPUBLIC	8.4	10	2.1	6.1
UNITED AIRCRAFT	7.7	10.6	3.6	4.9

The engineering department that currently produces the "best" in the long range R-335, F-86, T-33, the F-100 Sabre jet series, A-1, F-101, F-102, B-57, B-58, offers engineers a real opportunity to work on some of the most interesting projects in the aerospace industry today. For engineers like yourself, the future is bright.

North America's Extremes
Salaries competitive with other real expenses + Free uniforms + A generous retirement + Complete employee service program + Cost of living bonuses + Job security + a pay + Present facilities and equipment + Excellent opportunities for advancement + Company pension plan + Retirement plan + Life insurance + Death + Critical care + Accidental death + Disability + Group health + Low rate group health, accident and life insurance + A company 24 years young

CHECK THESE OPPORTUNITIES AT North American

- Aeronautics
- Structural Engineers
- Aircraft Engineers and Production Specialists in all fields of aircraft engineering
- Research and Engineering Projects
- Engineers with skills integral to aircraft engineering

NORTH AMERICAN AVIATION, INC.

North American has built more airplanes than any other company in the world.
Engineering Personnel Office
Los Angeles International Airport
Los Angeles 44, Calif. Columbus 34, Ohio

Industry Profit Margin is Down

Aviation's average earnings rate of 2.2% after taxes compares with national manufacturing average of 6.2%.

A prominent square on aircraft profit margins is evident from an analysis of 1951 annual reports. With one exception, every company reported shows a lower rate of earnings on sales both before and after taxes. This is indicated in the accompanying table summarizing profit margins.

Special Conditions In addition to the trend toward lower profit margins prevalent in recent years, general cost factors resulting during 1951 served to reduce earnings even further.

Taxing up. In any large-scale expansion of aircraft production there is an unavoidably long production period during which building up, training of personnel, and the assembly of materials and components must take place before volume output can result.

Shortages. The difficulties entailed in such production were compounded in 1951 by acute shortages of materials and technical tools. Furthermore, as will suddenly note, left their impact in the failure of key manufacturing processes to move as planned.

Brakes. Deteriorating labor troubles who had their effect. Strikes at aluminum plants, for instance, delayed shortages of new materials which put production of jet engines at a standstill. This, in turn, served to slow down the entire aircraft production schedule.

As a consequence, 1951 was an extremely disappointing year both for the household of aircraft production, deliveries and earnings. Estimates early state that while industry rates were up about 20% over 1950, net profits were

sustainedly lower for the group. Net Stamps-Rotary margins before taxes now range from a low of 3.5% for Convair to a high of 10.7% for McDonnell in 1951. The range in 1950 again starts with Convair at the low point 4.1% and Convair's high of 12.8%. Convair profit margin in 1950 was at a much higher level, however. In that year, eight of the 11 companies showed net profit margin greater than 9%, in 1951 only two were above that point.

Both Grumman and McDonnell show higher profit margins than the rest of the group. This may be a reflection of the distinctive type operations peculiar to Navy aircraft procurement, which have been known to benefit both the manufacturer and the buyer. On the other hand, Convair's low profit margins as a desert attribute of the predominance of jet construction and flight agreements which greatly increase the company's risk.

Most Air Force contracts are of the fixed price type with price adjustments to the government. All funds received through price adjustments are spent available for procurement and not allocated to the Treasury, or perhaps with acceptance under renegotiation. For the system Air Force appears to prefer the type of agreement. But if this serves no purpose, it might as well be dropped.

On Take-off. To a greater company's earnings while on the ground, but a misleading. The combination of profit off from becomes evident in the accompanying table. Most aircraft costs generally were subject to excess profit

losses last year. As a consequence, Bell, for example, which showed a pre-tax profit margin of 7.85%, wound up with only a 2.45% rate after taxes. Similar severe reductions are evident for the other companies during 1951.

While taxes also took a substantial bite in 1950's earnings, the cut was not so sharp. The reduction in profit margins was one half of the profit levels that year instead of by more than two thirds in 1951. Convair was the exception, getting a 1950 tax shield.

The profit margins often taken for 1951 were at the lowest point in the aircraft industry's history. Only one company, McDonnell, was able to stand up and better the 1950 rate.

The individual components of the aircraft enterprises are summarized by the several consolidations assembled in the National City Bank of New York. A current summary prepared by NCBS shows that a group of 29 aircraft and parts companies had an average profit margin, after taxes, of 12.2% for 1951, compared with 4.5% for 1950. This let no doubt indicates company operating at a deficit. For example, the Glass L. Marx Co.'s loss of more than \$22 million pulled down the 1951 average. This group of 29 aircraft and parts companies show aggregate net profits, after taxes, of \$37.6 million in 1951, down 32% from the \$58.4 million recorded in 1950.

By contrast, the average profit margin for a group of 1,785 manufacturing companies is revealed by the National City Bank study, as 6.2% for 1951, almost three times better than the aircraft enterprises. For 1950 the total manufacturing group showed an average profit margin of 7.7%.

From another Angle-Aerospace earnings of profitability disclosed by the National City Bank review is that on "Book Net Assets," which may be construed as the investment. In this instance, the same 29 aircraft and parts firms recorded a return average of 9.9% in 1951, compared with 11.5% in 1950. The expansion of all aircraft manufacturing companies declined, averaging 14.4% in 1951, 17.1% in 1950.

It is questionable, however, to apply earnings to the investment in the aircraft group without detailed qualification. The intent of government and industry, leased to selected companies may offset increased production capacity without a corresponding investment. Further, capital may merely represent plant facilities which have long been depreciated but are still utilized as the basic assets of the company. In some cases, when applied on this basis, Modern's replacement cost is a 50% more substantial capital today and also lead to improved efficiency and lower costs. Although



over 10

years

LEDEX ROTARY SOLENOIDS



G.H. Leland
INC.

FOR MODERN AIRCRAFT DESIGNS...
THERE ARE ALWAYS NEW AIRCRAFT SWITCHES AT

MICRO SWITCH



Just as important to aircraft designers as the small size, light weight and ruggedness of MICRO precision switches is the wide variety of special switches which MICRO has designed to meet the toughest kind of military "specs."

Precise MICRO units are long proved, dependable components for such applications as: screw jack limits, wing fold limits, flap limits, cockpit lighting controls, fire control masking, door interlocks, fire fighting devices, barometric pressure elevators, landing gear limits, wing lock indicators, throttle warnings, gun turret limits, propeller controls . . . and many others.

Perhaps YOU need a new switch . . . or one of these or some entirely different applications. MICRO field engineers are conveniently located to help select, or if need be, develop just the switch you may require. Call the nearest MICRO SWITCH branch office.

Let a MICRO SWITCH
Engineer show you how
you can "use MICRO
Precision Switches
as a principle
of good design."

MICRO SWITCH

FREIGHTER, ILLINOIS

MICRO Snap-Action Switches . . . Honeywell Mercury Switches

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY



INFORMATION on positions at NORTHROP

Northrop Aircraft, Inc. is engaged in the most challenging work of a long career devoted to scientific and engineering development, as well as aircraft production. This includes new, long-range projects of the utmost importance and interest. Exceptional opportunities await qualified individuals.

The most responsible positions will go to top-notch engineers and scientists. However, a number of excellent positions exist for capable, but less experienced, engineers. Some examples of the types of positions now open are:

ELectronic Product Engineers -
- ELECTRONIC INFORMATION SYSTEMS
- RADAR ENGINEERS
- FLIGHT-TEST ENGINEERS - RADAR
- AIRBORNE - AERO- AND
- TELECOMMUNICATED - REVO-
- MECHANICALS - POWER-PLANT
- INSTALLATION DESIGNERS
- STRUCTURAL DESIGNERS - ELECTRO-
- MECHANICAL DESIGNERS - ELECTRICAL
- INSTALLATION DESIGNERS

Qualified engineers and scientists who wish to locate permanently in Southern California are invited to write for further information regarding these interesting, long-range positions. Please include an outline of your experience and training.

Allowances for travel expenses.

Address correspondence to
Director of Engineering,

**NORTHROP
AIRCRAFT, INC.**

1100 N. BROADWAY
LOS ANGELES 45, CALIFORNIA

U.S. Air Force Northrop Scorpion F/A-10s are guarding America's boundaries in ever-increasing numbers. The Scorpion is designed and built by the engineers and craftsmen who produced the deadly Black Widows. P-61 of World War II fame.

NORTHROP AIRCRAFT, INC.
NORTHROP, CALIFORNIA

FOUNDER OF THE AGE OF NIGHT AND ALL WEATHER PILOTS

LETTERS

Let's Stress Safety

The dust has settled a little on the Elizabeth problems and, although I hope still the last, has given us a quiet time for a while. This is the time to review the facts and to look forward to the future. I have often felt that *Aerospace* "Wrote half as much as it talked" regarding the proper care and policies of the aviation industry.

All the competitive advertising, interviews and less of temper than the rest don't change the fact that people do get killed in (and new) big airplanes. Too frequently we witness the same old mistakes.

Machine gun barrels reduced the dust. Now an aircraft designer or foreign regular or straight major or minor has a test position in other aircraft when he takes control of the *SAFETY*.

It has been said that the word is the "soul of the word." Assuming this has a grain of truth, isn't the *safety* soul gone? Hasn't the industry's policy of avoiding accidents, publicity perhaps more reason for the lack of safety? The industry is a mirror of society when the records show in 1960 of the CAA and FAA, for some one of aviation's big people in have demonstrated the free enterprise system by investing \$100 million.

There has been an awful lot in print on this subject. How can the average person, even if he is involved in the industry, know what to do? We have been up safety close to the vest. It has not been a public problem, but a private discussion and dealt with in a very small group of professionals.

Now, I think it's a wise, healthful thing that plain people should be involved in safety. The engineers haven't learned to do it yet and we are going to repeat the fact that we have to partly sell operations to people who don't know our job at all as plain from another. But if we get any more into our sounding boards, and I think they can be repeated, we will have just up with people who "don't care" and "don't want to."

Roger Robison
15 Sharp Hill Road
Whitney, Calif.

How Many Viscounts?

Your issue for 21 accurately stated that 40 Viscounts are in service with British European Airways would be 115% total capacity for British in regional flights and high altitude.

In view of the wide reading of your paper, this report has led to considerable discussion and one London Office suggested that we should have a new issue with a view to publishing a committee. The suggestion was that we have add 10 to British European Airways, 12 to Air France and 4 to Air Lufthansa. Regret of the BEA committee mentioned a figure of 20 and it is possible that the Corporation will eventually take some of these 10.

There is no question of the Viscount needing radical assistance for takeoff, even

under typical or high altitude conditions. In the course of our recent inspection flights in Africa with Northwest Airlines, as well as with commercial operators, the takeoff performance of the Viscount has been quite good with the flight crew. There would be no cause for the next inspection.

I have, as far as my information can indicate in the subject, no should be granted if one would let me know.

Jack E. Yost
Viscount Leader
Victor House
Brentford, Middlesex, London S.W. 1

Aro Confusion

This letter is written in behalf of my client, *The Aro Equipment Corp.*, Beau Geste in the Mar. 18 issue of *Aerospace*. What I am sure you will agree is that the story is a gross misrepresentation of the facts. As far as I am concerned, the story is the soul of the word. Assuming this has a grain of truth, isn't the *safety* soul gone? Hasn't the industry's policy of avoiding accidents, publicity perhaps more reason for the lack of safety? The industry is a mirror of society when the records show in 1960 of the CAA and FAA, for some one of aviation's big people in have demonstrated the free enterprise system by investing \$100 million.

There has been an awful lot in print on this subject. How can the average person, even if he is involved in the industry, know what to do? We have been up safety close to the vest. It has not been a public problem, but a private discussion and dealt with in a very small group of professionals.

Now, I think it's a wise, healthful thing that plain people should be involved in safety. The engineers haven't learned to do it yet and we are going to repeat the fact that we have to partly sell operations to people who don't know our job at all as plain from another. But if we get any more into our sounding boards, and I think they can be repeated, we will have just up with people who "don't care" and "don't want to."

Roger Robison
15 Sharp Hill Road
Whitney, Calif.

Editorial Department

Aerospace

McGraw-Hill Publishing Co.

350 Madison Ave., New York 17, N.Y.

McGraw-Hill Building

San Francisco 45, Calif.

confusion, it is my understanding that shortly all CAA, FAA, Fire and Navy charts will be in metric units.

Where is the "extra useful information" approach? Increasing speed is an approach for landing high air speeds, more an assigned altitude in an area available for landing as it is calculated in levels above.

There should be no need problem for a pilot to measure his critical speeds for his airplane as quickly as it was for him to measure them originally as angle when he checked out in the place on the first place. Perhaps *Aerospace* could be made of calculating those critical speeds for the reader that is watching an approach under load instead of looking and remembering to ask flying speed on the radio itself. If he had learned his landing speeds in levels and then was confronted with an approach he might not even notice it.

All things considered, it appears at this point, when we look back, that it is set on record as it stands as a standard we have not necessarily got into trouble with.

L. C. COOPER *HARRY G. FISKE*
Controller, Flight Logistic Air Wing
Atlantic/Caspian
NAS, Patuxent River, Md.

Aiding Handicapped

I read your recent article on employment of handicapped people by Bell Aircraft in a Feb. 1 issue. Being a handicapped person myself, I have a few comments which I hope will be helpful. First, Bell is doing a fine job. I am sure you have seen the photo of the head of the plant who has a very apparent physical handicap. He is a good man.

It will be an aid to the rehabilitation of the handicapped to make it clear that the employer not only wants to employ the handicapped but would probably help if you publicized in an early issue a classification of this status because The Aro Equipment Corp. is in no way connected with the AWD Companies which own Bell.

Howard R. Roberts
Rector & Roberts, Inc.
413 Wood St.
Pittsburgh, Pa.

Knots and Mph.

Long ago you gave me a copy of the January of Air Transport, which I have since lost. I am sorry to say that I have since learned to be repetitive of many issues—so that this may not be anything, larger and better.

Brian C. Cooper
Public Relations Officer
Headquarters Air Transport and
International Airlines, Endicott
Montgomery County, N.Y.

(The letter above is typical of many you receive. Letters of this nature received from readers of *Aerospace* will appear in *Editor's Column*—Ex-Ex)

Elizabeth

I wanted to congratulate you on your handling of the Elizabeth accident in the Feb. 18 issue. I was particularly interested in the material in the lead and the statement of the number of civilian fatalities over Elizabeth.

JAMES H. GRIFFITH
1910 Connecticut St., N.W.
Washington 16, D.C.

Sixth '52 Crash Spurs New Safety Pleas

- Pilots press for drastic action to improve worsening situation; CAB delays action on recommendations.
- Bat Board grounds Robin Airlines following C-46 crash; company had 40 alleged safety violations.

On the same day (April 18) that CAB proposed a regulation to make pilot-training standards of some non-scheduled airfares, a second C-46 crashed into the top of a hill-decked Los Angeles hill, killing all 29 aboard.

It was the third fatal accident this month, the sixth since Jan. 1 and the fourth in six weeks.

But it was the year's first fatal crash for the year. It brought the total fatalities since Jan. 1 to an estimated 11.5 per 100 million passenger miles flown to date, compared with 7.8 for the full year 1951.

CAA Administrator Charles Hance suspended operating rights of the accident operator—Robin Airlines. And he asked CAB to revoke Robin's registration permanently. The plane involved apparently was lost when it crashed. It belonged to Robin, which was doing business on that flight at North Central Airlines. CAA and Administrator Hance had previously been cited by CAB for 40 alleged violations of safety regulations.

More Domestic Action—Meanwhile the Pan American DC-4 took off the week before last, headed for Honolulu. Its safety rate is an estimated 2.4 per 100 million passenger miles, including Northwest's better than charter crash, compared with 1.3 for all of 1951.

An Air Line Pilots Assoc. spokesman told AVIATION WEEK that they have recently pushed for more drastic action to improve the apparently worsening safety position on all types of aircraft.

But a check by AVIATION WEEK revealed that at least last week the new requested pilot regulation was the sole important change that CAB's Safety Investigation Bureau had planned.

Yet even before the Pan American loss of 52 passengers in the DC-4 water landing of See Jane this month, ALPA had asked CAB to take the airline in and make available the tools and other survival equipment on transports en route to emergency flights.

In the two water landings so far this year by airlines (Northwest and Pan American), 58 passengers have died of drowning or freezing in the water while a few apparently

were injured during the initial landing. No improvement—but CAB safety regulators said John Chisholm will wait until he's considering any new regulations such as the pilot-prepared improvement in "fletching" equipment.

Cold Aerodynamics Board generally accepts new safety regulations; CAB safety regulators said John Chisholm will wait until he's considering any new regulations such as the pilot-prepared improvement in "fletching" equipment.

► **Designate a check pilot** who must be responsible for proper checking of pilot qualifications. Most big non-scheduled operators already have such a check pilot, but smaller operators sometimes check their pilots through another airline or even hire pilots for a day or so without demanding that they check up requirements of all CAB rules. Now one pilot or any operator, no matter how small, must be responsible for proper check on pilot qualifications.

► **Designate a chief pilot** responsible that no individual is assigned as a pilot unless he has met all requirements of CAB Air Regulation 10. This has already led to CAB qualified, but on-call non-scheduled operators there. Operators of non-scheduled chartered flight making use of the head pilot were warned.

On a small line, the check pilot and chief pilot may be the same man. ► **Written pilot examinations** must be submitted by the operator to the pilots before they can be assigned work. Exams now include the company operator manual and automatic approach and navigation on routes to be flown.

Meanwhile, CAB has stepped up investigations of non-scheduled lines to make sure they meet existing moisture and pilot qualification standards. Robin's Misadventure—The last time Robin Airlines was in the news was last Dec. 20, when a Robin C-46 jet had ended up in a forced landing near Colgate, N.Y.

On Mar. 21, CAB asked CAB to start proceedings to revoke Robin's operating certificate. CAB cited about 35 counts of safety violations at that time of its loss in connection with the Colgate crash. CAB had never filed any preliminary charges in Los Angeles.

Courts in the original CAB case of last month released pilots not held on flight meter, not properly trained in plane type or instrument procedures or right landings, distributing fuel out of balance, and failing to file the flight plan on the Colgate flight. CAB also cited another recent Robin flight on which pilots were at the controls over the 5-hour flight without rest.

► **Nonlocal Registration**—Here are details of the new CAB-proposed regulation of non-scheduled airline pilot training—also stemming from evidence gleaned in investigation of some recent crashes.

four by bad navigation under adverse flight conditions, two by stall and one by collision.

Engines failure probably contributed to the See Jane DC-4 crash of Pan American, the Justice, N. Y., C-46 crash of U.S. Airlines, the Sand Spit, E.C. DC-4 crash of Northwest, and the Elizabeth, N. J., DC-4 crash of Miami Airlines. Prop reversal probably caused the Elizabeth, N. J., DC-4 crash of National. Navigation apparently caused the Los Angeles C-46 crash of Robin Airlines, the Fairbanks C-46 crash of Transoceanic, the Little Valley, N. Y.

Then, engine failure and navigation—sometimes a combination of the two—contribute to recent fatal crashes, with stalls as the third most frequent cause.

Details of Recent Fatal Crashes

As evidence several wing caused the recent fatal accidents.

CAB started a governmentwide study of how to prevent inadvertent prop reversal.

An Alas Pilots Assoc. came up with a prop reversal prevention method now being tried by Northwest Standard (AVIATION WEEK Apr. 14, p. 34). ► **Justina**, New York City, U.S. Airlines C-46F on Apr. 5 crashed into ice and buildings from east north of Colgate. After normal approach, Justina and three crewmen killed in the scheduled range flight. CAB investigation last week went to check on if a broken exterior deplane door had ice on engine could have caused enough power loss to cause the crash. Some witnesses reported they heard power loss.

CAB and pilot investigation say the plane apparently developed insufficient power to complete climb-out. Crew members said responsibility of the safety and other flying equipment such as flightlights, according to CAB and pilot investigations reporting on the crash.

► **Elizabeth, N.J.** National Airlines DC-4 on Feb. 11 crashed in winter fog under low See Jane with one gone out and feathered and another one on the side almost dead. Fifty-four passengers died. Thirteen survived an unbroken over-water flight. Some of tragic failures probably attributable to plane stuck in 1,000 ft. of water. Beloved passenger plane prevented entirely out during the duration of the plane float.

Last Quarter, 1951

- **Tacomaian, Atka, Transoceanic** 2.0 2 on Nov. 5 failed to gain altitude results in narrow clearance between propeller tips. One passenger failed on the resulting missed charter flight. Cabin was believed to be pilot's trying to lead low minimum weather (reported near zero-0000 after overflying Albuquerque, which had reported clear with bad weather ahead).

► **Oakhurst, Calif.** Owens National Airlines DC-4 on Nov. 16 fell to earth after losing tail in collision with California Eastern DC-1 in both planes strangled out radio case during instrument approach training. The case stalled in the noseid stiffened bottom

ang flight. Cabin behaved in the air properly, lost control of safety check pilot, presumably by fail-safe pilot who was attempting to land over ocean using altitude control load over trimmer making visibility impossible for both and tail-blunt for check pilot.

► **Glenwood, Colo. United Air Lines** DC-3 on Dec. 7 plunged in mud. Cabin was killed on this scheduled altitude training flight. Cabin was reported as a stall and spin from which there was no recovery for unknown reason. United initiated a more definite and conservative instrument procedure for check flight.

► **Elizabeth, N. J.** Marine Airlines C-46 on Dec. 10 plunged to earth shortly after taking off. Never Ascended. Four crew, 31 passengers killed on this scheduled passenger flight. CAB investigation found the cause as a stall contributed to by heavy load, power loss from one engine, which also a dead and fact pilot was low over densely populated part of city and could find no place to land.

► **Little Valley, N. Y.** Continental Charter C-46 on Dec. 25 flew into mountain. Five crew and 23 passengers killed, 24 survivors, in the rounded passenger flight. CAB finds crew was pilot error in continuing visual flight during instrument weather at night.

CAB further increased intensity of CAB enforcement inspections and cut allowable gross weight of the DC-4 to 45,300 lb., although that crash apparently was not caused by bad minimums at overflying.

► **See Jane, Puerto Rico** Pan American DC-4 on Apr. 11 landed in winter fog under low See Jane with one engine out and feathered and another one on the side almost dead. Fifty-four passengers died. Thirteen survived an unbroken over-water flight. Some of tragic failures probably attributable to plane stuck in 1,000 ft. of water. Beloved passenger plane prevented entirely out during the duration of the plane float.

Canada Approves Cargo Airline

Doral Air Transport Ltd., Montreal, has been licensed as the first all-cargo airline in Canada by the Air Transport Board. Chairman David G. Scott, Canadian Commercial Images, said it has 12 weeks in Canada and to obtain parts.

Doral Air Transport was to get its first C-45 by the end of March.

CAP Leases Airport

Compton Airport, near Washington, D. C., will soon be flying field, was leased April 3 for its operation, Arthur Hyde, to the Washington Civil Air Patrol wing for a year and will be owned by the wing as a CAP base. Hyde continues to operate Eddie Field at Chantilly, Md.

Locals Ask Increase in Mail Pay

Pioneer says it needs more income to operate 2-0-2s; All-American, Robinson, Southwest also ask increases.

Four local service carriers—All American, Pioneer, Reliance and Southwest—have asked CAB to increase their mail rates that were frozen because of rising costs.

Pioneer makes a special plea for added mail pay to cover the initially higher expense of operating nine Martin 2-0-2s bought to replace its 11 DC-3s. Pioneer, which also has ordered five Convair 340s for 1958 delivery, believes the first local service carrier to introduce modern, high-powered aircraft.

Total cost of five new Pioneer Martins and four Convairs is about \$50 million. Pioneer has added six 21-DC-3s to its force for \$1 million. Pioneer bought them as surplus C-47s from the War Assets Administration in 1946 for \$191,000 but claims the cost of overhauling and converting them to the total will up to about \$3 million.

All-American President Robert Love recently told CAB that if he doesn't get route extensions he risks losing the company. All-American operates part of the last remaining transcontinental air-mail and passenger system between Los Angeles and the Midwest.

Reliance, in its most recent petition for amendment, asks enough mail pay to create a fuel surcharge above the previously-estimated base-rate of 42 cents a revenue mile. Effective mail rate right now is about 154 cents.

Robinson first asked an increase on Feb. 26 based on its bad weather losses last winter. Robinson also cited compensation for losses from the Newark Airport closing. But the Board pointed out that a fuel surcharge is retrospective adjustment not possible. All it can do is to adjust the present rate so it applies to the future. CAB told Robinson, "No, Robinson, you have to go with the amendment to no petition."

Southwest, only a year ago when-

last asked for a no-in-mail pay, now Southern, now West American, also asks CAB to raise 70% in its effective mail pay. Actually, this is from a 1958 and presently estimated effective rate of 30-30 cents a mile to an estimated need of 51.70 cents. The 51.70-cent rate is shown in line with what other established local air mail rates are about 49 cents a mile.

Board Approves Airline Wage Hikes

Wage increases are now in effect that's approved for airline ground personnel are mostly lower than allowed under the 10% and cost-of-living factors. But pilots and cargo and feeder airline ground personnel rates have been allowed to exceed the maximums allowed.

This is disclosed by Chairman Neil M. Blodgett as a result of examining the file on negotiations during May 31, of the negotiations of the Railroad and Airline Wage Board. RAWB received 172 applications from airlines for separate wage adjustments and proposed of 105, leaving a balance of 67 on hand on April 1.

New wage contracts going into effect at 11:45 A.M. today and instituting a flight pay formula for copilots on almost all domestic flights have been approved by RAWB. The Board set the various terms after consulting with the airlines because of the objective way to structure the pilots and cabin crews.

Allowable increases were approved for employees of smaller "feeder" lines and cargo carriers because those specific rates had increased substantially since 1948, the Board said.

Various adjustments have been proposed for other flight personnel, including stewardesses and flight captains.



RAF ORDERS 30 MARATHONS

de Havilland Page (Stirling) has received an RAF contract for 30 low-wing Marathons similar to the one pictured above for use in advanced navigation trainers. Initial deliveries are to be made in three months. Range will be sufficient to permit training flights from Britain to Malta and Gibraltar. de Havilland Page also has received orders for fifteen

AVIATION WEEK, April 26, 1958

American to Drop Block Ticket Plan

American Airlines plans to drop its so-called "block ticket plan," notes which American sells blocks of tickets in large organizations for revenue instead of to passengers.

American's plan, told Civil Aeronautics Board it would rather drop the system than fight a lengthy proceeding before the Board against complaints of that rate, United and the travel agents. The complaint got CAB to start an investigation of whether the system is "discriminatory."

American will drop the program this month if CAB will close the case.

The complainants charged the airline gave American "unfair advantage" when a company travel department holds a block of tickets for use in densely populated areas. American said it was just another sales method, and any airline could do it.

But an American official said the airline obviously can't wish to sell the short-term version which it said is considered waste. So rather than continue half-heartedly under the heading and add expense of the proceeding itself, American is ready to quit.

CAB had asked the complaining lines to elaborate the issue at possible air carrier agreements. But the lines refused to comment on it to CAB. So the Board passed the investigation—relatively American says.

Now, if the lines and CAB drop the matter, the "block ticket plan" probably will die at least for the present.

Brazil's Traffic

(McGraw-Hill World News)

Rio de Janeiro—for transport ships and covering activity at the 38 top ranking airports in Brazil during 1957 showed a 13.6% increase compared to 1956 and 1.674 million passengers handled.

Increasing world demand for aircraft travel. The figures 2,197,440 and 1,941,766. Rio de Janeiro's Air traffic loaded to Brazil weighed 17,714,088. 55,535,191 Ds. were unloaded.

The largest fields, in order of size, are São Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Campinas, Salvador and Recife.

Air Travel Up in Hawaii

The Hawaii Association Commission reports an 11.7% increase in international air travel during the six principal islands of the Hawaiian chain in 1957.

There were 495,490 passengers carried with 436,913 in 1956.

Differential PRESSURE SWITCHES FOR SAFER AIRCRAFT TODAY AND TOMORROW



A wide selection of precision-built differential pressure switches is available for your aircraft today—and for those still "on the boards."

Managing, Maxwell & Moore switches now provide maximum safety in many aircraft. They sense fuel, oil and air pressure, flash warning lights of many kinds, actuate valves and switch repetitive circuits, and perform numerous other tasks.

Flexibility of switch designs permits engineering to your specific needs. All models have a highly sensitive differential pressure sensing element with a non-metallic long durability. Accurate operation at any predetermined pressure within range and a maximum life of 100,000 cycles are assured. Switches in through SPDT contacts, microswitches or relays, depending on load characteristics. Pressure differential and range are internally adjustable.

Rugged construction provides functional perfection throughout the vibration range of modern jet and propeller-driven aircraft. All models meet environmental requirements of MIL-E-2812, specification. Effects of ambient temperatures from minus 65°F to plus 350°F are engineered out of all switches; some models withstand up to 350°F.

Let us help you build better, safer aircraft. Write today for engineering counsel on your specific pressure switch application problems. No cost or obligation.

AIRCRAFT PRESSURE SWITCHES

A Product Of

MANNING, MAXWELL & MOORE, INC.
330 East Main Street, Stratford, Connecticut



For the fabrication of canopy covers... Specify COATED FABRICS by **BRUNSENE**

For the complete protection of all kinds of plastic components of aircraft, such as canopies, interiors, etc., against sand, snow, heat, fire and dust. Resistant to gasoline, abrasives and extremes of heat and cold.

We welcome the opportunity of working with your engineers in developing new coated fabrics for the Aircraft Industry. Consult our representative or write our Atlanta Department.

CHICAGO D. Burrell & Co. 311 South Franklin St., Webster 2-3442
BETHESDA J. L. Gibson 1116 Belmont Drive, Bethesda, Legion 2-2484
PORT WASHINGTON J. A. Supply & Equipment Co. 2114 River Road, Vt. 6452
LOS ANGELES C. E. Johnson 110 South St., Los Angeles, Wilshire 7-1212
NEW YORK Lee Marshall Co. 45 West 36th Street, Murray Hill 6-6760
SEATTLE R. C. King, Inc. 317 Madison Street, Pioneer 2-1750
WICHITA Associated Metals Sales, Inc. 1209 1st Douglas Ave., 4-6176
MONTREAL Son Soule Co., Ltd. 4215 Fairmount Street, Duluth 6-5755

THE BRUNSENE CO.

Watertown, Mass.

A DIVISION OF
THE H.M. SAWYER & SON CO.
 ESTABLISHED 1846

Watertown 4-6520

narco Check List

HIGH PERFORMANCE - LOW COST RADIO EQUIPMENT

These items have won NARCO VHF com-
munications and navigation systems sold thus
far for your needs. For your convenience
NARCO dealers. If you don't know who these
dealers are, write today. You'll immediately reply.

Complete system, GAMI, VHF, U channel VHF
Transmitter—receivers VHF Receivers, UHF locator,
75 m Marker. Weights only 1875 lbs.

Low cost GMNO and U channel VHF Transmitter
and tunable VHF Receiver. Roll-on power supply,
easy to install, weights only 1025 lbs.

Ground station for repeaters. Two Way VHF,
crystal controlled, easy to install and operate.

Range and Broadcast receiver. No memory,
solid state, only 33 lbs complete.

VHF E channel transponder and low frequency
receiver roll in one unit. Ideal for small plane
weights 7.4 lbs.

EVEN NARCO UNIT COMPRISES HIGH PERFORMANCE, LIGHT WEIGHT AND LOW COST!
NARCO NATIONAL AERONAUTICAL CORPORATION
 AMERICA, INC.
 Perfection in aeronautics

Another Nonsked Halted by CAB

In a 4-1 decision the Civil Aeronautics Board has suspended and enjoined operation of American Air Transport, a non-scheduled operator. The Board suspended AAT's letter of authority, except for military flights, because it flew more frequently and regularly than CAB's permit economic regulations permit for "large unprofitable carriers."

AAT flew between Miami and New York about five times a week.

CAB Member Joseph P. Afrima dissented, primarily on grounds that administrative injunction is not required by the public welfare doctrine. Afrima intended that AAT be permitted to operate on isolated frequency until the Board makes final decisions on its move to revoke AAT's registration.

► Didn't take "No." The Board order points out that AAT continued operations after the Board issued a cease-and-desist order. That makes AAT's conduct "intentional and flagrant," the Board says. "Unless we suspend the letter of authority, the carrier will continue flagrantly to violate the Civil Aeronautics Act . . . our failure to respond at this time would encourage similar violations by other illegal carriers."

The majority rejects AAT's contention that its average of 32,000 Midwest-bound passengers a year provides a valid rationale that in the absence of proof that the public interest is not served by the carrier there can be no injunction.

The Board answered the "public service" argument by stating: "In the event that our lack of service is brought to our attention, we have ample means available for amending the situation."

► Bill Weisheit, Joseph Afrima says, "A careful search of the record fails to reveal a single instance in the Board's history . . . where the Board has ordered a certificate carrier to name a demonstrated need for service."

Afrima concludes his dissent by criticizing the majority for being so lenient on "a chronic late, slow service" by an overconcerned desire to "protect" rather than to "punish and discipline" air transportation systems."

Lama Profit

(McGraw-Hill World News)

Regina-Air profit of approximately \$54 million has been recorded by Linen Airline Nationalis Companhia (Lama) during the three months October through December, 1951, against monthly losses of \$20,000 prior to the carrier's merger with Avianca.

SHORTLINES

► Air Coach Transport Corp. has called a special membership meeting May 5-7. Three major subjects anticipated before participation in Air Force maintenance programs for embankments, CAB economic investigation of non-scheduled air transportation, and revision of the military traffic agreement that expires June 30.

► An Line Pilots Association reports in the March "Air Line Pilot" a paper by Dr. Ross A. McWherter citing evidence that age is relatively unimportant in judging pilot capabilities of a man in good health. Since 20% of airline pilots were over 40 in 1950, "At present we do not know how long pilots will be able to fly," he concludes.

► KLM Royal Dutch Airlines is slated to go first of nine 747-200B Super Constellations from Lockheed later this year. This will be the first commercial engineless aircraft ever produced and may last a half-million hr. At \$400,000 each, delivery to Super Constellate probably is building toward a three-fold operating before year-end.

► National Air Freight Corp. denied of a letter of injunction by CAB is upheld by U.S. Court of Appeals. D.C. court agreed with CAB that NAFIC is controlled by surface transport interests.

► Northwest Airlines has been forced to reduce schedules temporarily because of flood damage to its central facilities at St. Paul.

► Sabena, Belgian airline, has CAB no objection to an approved repair station for maintenance of U.S. planes.

► Scandinavian Airlines System has its U.S. foreign air carrier permit renewed by CAB for an indefinite period, serving New York, Chicago and Scandinavia.

► Skick Airways reports March air freight volume of 6,137,712 lbs up 30% over a year ago. Load factor was 81%. Skick attributes the increase to shipments of heavy machinery going uncut to Skick.

► United Air Lines reports a record March, with 169,194,000 revenue passenger miles—up 20% from a year ago. Upturn from Feb. to 15% for passenger traffic.

► U.S. Chamber of Commerce feels that the transportation industry paid \$24 billion in 1951 taxes—more than double industry earnings of about \$12 billion.

PV VENTURAS AVAILABLE IMMEDIATELY

From 45 hrs. t. t. to 453 hrs. t. t.

We have two hangars completely filled with new spare parts, plus 9 completely disassembled new aircraft, also to be sold for spare parts or assembled.

Entire R. C. A. F. balance of stock, purchased by us.

SEE THEM AT TETERBORD, N. J.

Also currently available:

2 Lodestars

1-C-47 Airliner

1-C-47 Freighter

LET US SUPPLY YOUR NEEDS

Executive Aircraft
Sales

AMERICAN AIRCRAFT CORP.

Domestic

Hot Air Control Board
Tetronair Air Transport
Teterboro, N. J.

International

Hawaiian Islands E-6279-1482
Foreign Airlines
Representatives

SAFER LANDINGS SELL MORE PLANES



Aero-matic

(Formerly Aeromobile Corp.)

Technell makes planes where there's equipped with Aeromobile's world's only automatic variable pitch propellers for personal planes. These that adds safety, makes a plane twice as fast, and twice as safe. Write or wire to Aeromobile Corporation, 1600 Aeromobile Parkway Drive, Box 3000, Indianapolis 6, Indiana.

Chance Vought Aircraft, builder and designer of the "Corsair" and "Gambit," has openings for up-level technical personnel in administration and expediting for supervisory positions in time route development and status programs on piloted and piloted aircraft.

Reliability supervisor is required for establishment and maintenance of reliability reliability of structures and control systems. Requires degree in electrical engineering, advanced studies in materials plus 5 to 8 years related experience.

Guidance supervisor must direct a group in the analysis, design and development of electronic guidance systems for piloted aircraft. Requires sound knowledge of guidance, design and control systems. Requires M.S. in electronic engineering with 5 to 8 years related experience.

Aerodynamics project engineer—one direct group in the analysis and solution of problems involving aerodynamics and stability of aircraft and systems in relation to aircraft performance. Requires extensive knowledge of physics, aerodynamics, conventional engineering and highly specialized knowledge to the field of transonic research. Equivalent to Ph.D. and 5 to 8 years related experience.

Excellent salaries and working conditions. Starting mobility available in Dallas area. Liberal moving allowances. Submit resume of education and technical experience to engineering personnel office.

CHANCE VOUGHT AIRCRAFT

SECTION OF UNITED AIRCRAFT CORPORATION
P. O. BOX 5907 • DALLAS, TEXAS

Needed Now!

Structures Engineers
Designing all aircraft structures—either military or commercial.

Aerodynamics Engineers
Two in our test facility, one in our design department, one in our research.

Martin has the greatest program of aircraft research in the United States. We have the largest aircraft fleet in the world, and the most advanced facilities for aircraft design, development and flight testing.

Martin has the greatest program of aircraft research in the United States. We have the largest aircraft fleet in the world, and the most advanced facilities for aircraft design, development and flight testing.

The GILDED L. MARTIN CO.
Personnel Dept., • Baltimore 5, Md.

Complete Reliable HELICOPTER SERVICE

- Helicopters for Rent - Anywhere
- Flight and Maintenance Training

NEW ENGLAND HELICOPTER SERVICE, INC.
Box 120 • 348 Main Street • Wrentham, R. I.
World's oldest helicopter service.

Executive Aircraft Overhaul AND CONVERSION

Interior, Radio Installation, Engine Changes and Engineering. We can handle your job TODAY!

ENGINEERING & MANUFACTURING CDRF.
P.O. Box 479 • Galveston, Texas

CONVAIR DR-36 ENGINES

Two 1500-hp. CAA DR-36 engines with 100 hours since overhauled by our division.

Timberline School of Aeronautics • Lakewood, N. J.

EXECUTIVE BOEING!!

WHAT OTHER EXECUTIVE AIRCRAFT WILL DO THIS JOB!!

- Price \$100,000. (L-101) • Immediately Available
- Price \$100,000. (L-101) • Fully instrumented ready to fly anywhere in the world. CAA certified.
- Price \$100,000. (L-101) • This is the airplane you have been looking for.
- Price \$100,000. (L-101) • With or w/o CAA.

LIEWEARD AERONAUTICAL
Rocky Mountain, Colo. — or — Waco, Tex.
P. O. Box 5245

L. E. S. SERVICE CORPORATION
Waco, Tex. • 1000 N. Waco • Waco, Tex.
Phone: 74-2222

A. W. CRUSE
A. W. Cruse Corporation
Waco, Tex. • 1000 N. Waco • Waco, Tex.
Phone: 74-2222

AVAILABLE NOW

NORTH AMERICAN AT-6's

We have 8 of the best AT-6's in the country. They are in excellent condition. All have been completely overhauled. All have been instrumented. All have been equipped with the latest electronic equipment. All have been checked out by our maintenance department.

LEUFKIN AEROFLIGHT
Fort Wayne, Ind. — or — Waco, Tex.
Phone: 74-2222

AVIATION NEWS, April 26, 1962

BABB OWNED SHIPS FOR SALE

A. DC-3 (C-47E). Low total time. Very fine since major overhaul. \$1830-92%. Cargo. Price \$95,000.

B. DC-2 (C-47A). Excellent condition. 21 passenger. \$1830-92%. 1955,000.

C. DC-3 (C-53). 24 Volts. 21 passenger interior. Excellent condition. \$1830-92%. Perfect for executive conversion. Price \$95,000.

D. Lockheed Executive. Just out of overhaul. 1950 built total. Spokane. One of the best in the country. \$1830-92%. All weather radio, denting equipment and full radio. \$90,000.

E. Lockheed Relocated. Excellent for conversion. \$45,000.

F. Lockheed 12A. Just overhauled and licensed. Spokane. Good radio. New instrument panel. \$80,000.

G. C-46A. Cargo-passenger. Very good condition. \$90,000.

H. Vultee. Very good skin. CAA overhauled engines. Heavy gear. Can handle executive conversion to customer's specifications. Price upon request.

All of these ships Babbs Company owned and subject to prior sale. This is a partial list of our aircraft and we solicit inquiries and offerings for sale.

THE BABB COMPANY, INC.

Hanger #E, Newark Airport • Newark, N. J.
Telephone Market 4-0410
Glendale, Calif. • Washington, D. C.

Ten 1830-92's

All low total time
Zero time since
Major overhaul

By:
Southwest Armature
The cleanest block of
engines in U. S.

- \$ 1830-43-92 CP300919 8T-95
- \$ 1830-43-92 81365 8T-95
- \$ 1830-43-92 CP410134 8T-95
- \$ 1830-43-92 CP320065 8T-95
- \$ 1830-43-92 CP370093 8T-95
- \$ 1830-43-92 CP320060 8T-95
- \$ 1830-43-92 CP410348 7T-95
- \$ 1830-43-92 CP410342 7T-95
- \$ 1830-43-92 CP420038 7T-95
- \$ 1830-43-92 CP420036 7T-95

For more information call
J. O. WOMACK
Phone: EM 2870

MUSTANG AVIATION
Box F132 • Dallas, Texas

AC SPARK PLUG DIVISION
of
GENERAL MOTORS CORPORATION
PRECISION INSTRUMENT PLANT

Positions are available for highly skilled persons in the field of electronic instruments, electric-mechanical control equipment.

MECHANICAL DESIGN ENGINEERS
ELECTRONIC ENGINEERS
SERVO ENGINEERS
 ELECTRONIC DESIGNERS
MECHANICAL DESIGNERS

New and expanding divisions of an established firm with 30 years of successful experience in the environmental field. Work involves design of both the mechanical and electronic parts of complex electronic equipment at the most advanced type.

Write or Apply

AC Spark Plug Division
GENERAL MOTORS CORPORATION
1525 E. Kenworth Place
Milwaukee 2, Wisconsin

The California Institute of Technology
Jet Propulsion Laboratory
Pasadena, California

... has several openings in the following engineering fields:

Preliminary Design
Engineering Analysis
Acoustics
Aeroelasticity
Heat Transfer
Thermodynamics
Dynamics
Structural Studies
Material Studies
Ground Support
Computer Systems Development
Test Equipment—Wind Tunnel
Temperature or Humidity
Wind-Tunnel Test Assembly

Excellent opportunities exist to learn all phases of rocket development. Positions are available for both experienced and well trained test personnel. Apply giving detailed preference to academic background and work experience.

JET PROPULSION LABORATORY
4805 Oak Grove Drive
Pasadena 2, California

WANTED
Grade AAA-1 Factory Manager
For Eight Thousand Aircrafts

If you have demonstrated and can prove your ability, level, and experience and, also can apply for a top job in aircraft management, then you may be just right to receive our offer. You should investigate this opportunity which will provide the grade pay in a top grade position.

Attractive compensation, perfect food, complete hospitalization, retirement benefits, and improvements. All capital asset investments.

Call 214-744-1147

Or write:

PRODUCTION MANAGER WANTED
International Dynamics Corporation
3000 South Meridian Street
Indianapolis 8, Indiana

Excellent production sites available in great metropolitan areas.

H. G. CRAVENBERG & COMPANY
International Dynamics
3000 S. Meridian Blvd. • Indianapolis, Ind.

INSTRUMENTS

Authorized Factory Sales
and Service
for

* Eclipse—Pioneer
* Kollsman

* U. S. Gauge

CAA Approved Repair Station
#3344

Contractors to U. S. Air Force

Our stock of instruments is one of the largest in the East

IMMEDIATE DELIVERY

CALL 8 NAME 8 WRITE

INSTRUMENT ASSOCIATES

Telephone: Grant 4-1147
845 West Main Street, Grant Hotel, N. Y.
Telephone: WIL 2-8038, N. Y.

For more information call

J. O. WOMACK
Phone: EM 2870

MUSTANG AVIATION
Box F132 • Dallas, Texas

harbinger of a

NEW AIR AGE...

BOEING AIR FORCE STRATOFORTRESS



Size — power — capacity — speed — range — all are top-drawer secrets of this Boeing jet-powered bomber, the B-52. But this picture, released by the Air Force, promises a new aid in the continued defense of Democracy.

Foote Bros. is producing mechanical drives for this new air giant as it has for the Boeing B-47 and the B-50, the Stratocruiser and the Stratofreighter.

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 S. WESTERN BOULEVARD, CHICAGO 9, ILLINOIS

MECHANICAL UNITS PRODUCED BY FOOTE BROS. FOR THE BOEING B-47

